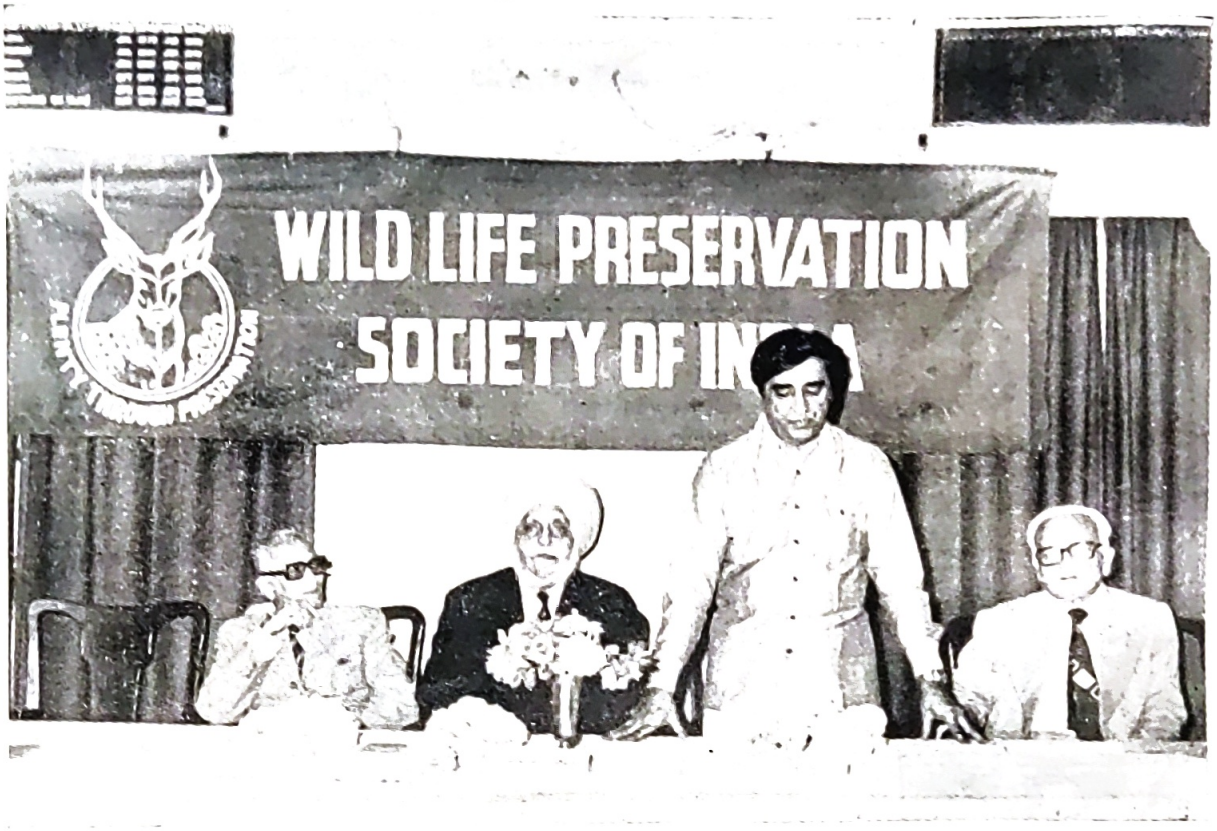
CHEETAL

JOURNAL OF

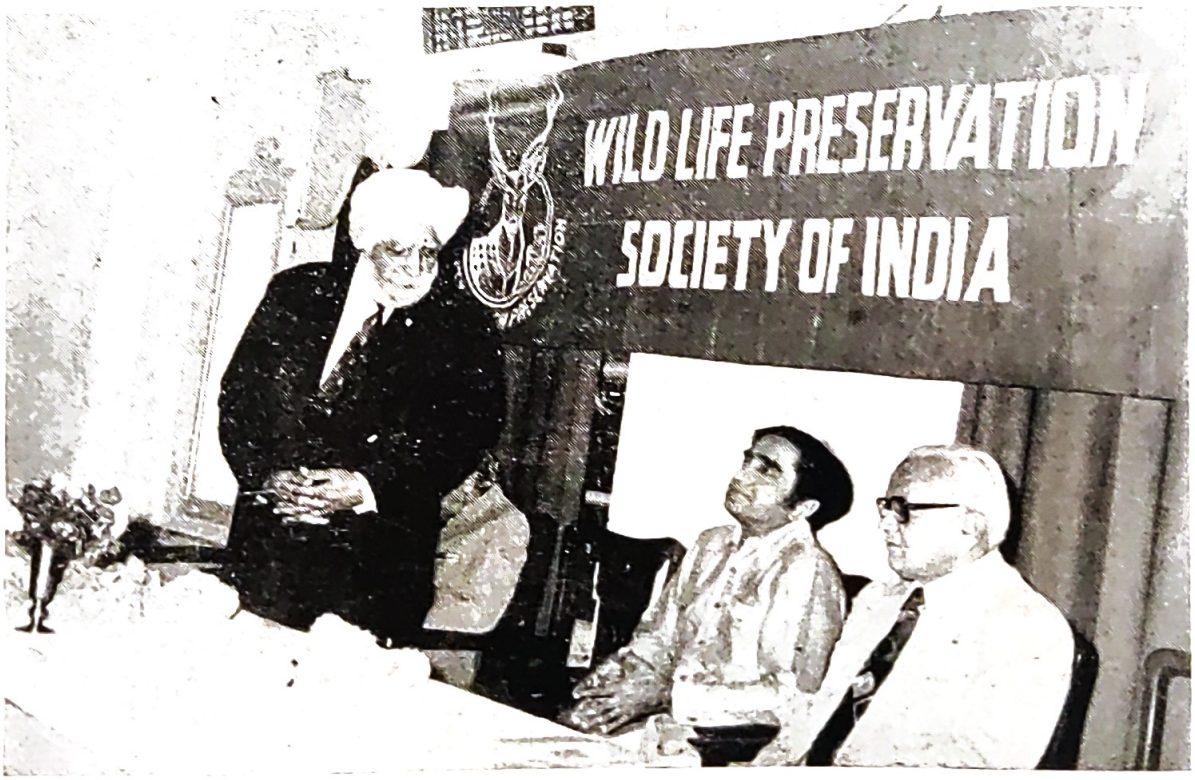
The Wildlife Preservation Society of India

Vol. 24 Sept. & Dec., 1982 No. 1 & 2

DEMOISELLE CRANES



Sri Digvijay Sinh, Minister for Environment, Government of India, addressing members of Wildlife Preservation Society of India.



Col. Pratap Singh Malvendra of Nabha, President of Wildlife Preservation Society of India, welcoming Shri Digvijay Sinh, Minister for Environment, Government of India.

PLEASE NOTE

The Department of Environment, Government of India are contemplating compilation of a Directory of (1) Ornithologists and (ii) Wildlife Ecologists, actively engaged in the studies of Indian Avifauna and Indian Wildlife respectively.

The concerned Ornithologists and Wildlife Ecologists are requested to send their brief biodata mentioning precisely the branch/group of their specialisation to The Director of Wildlife Preservation, Department of Environment, Bikaner House, Shahjahan Road, New Delhi-110011, with a copy to the Honorary Secretary, Wildlife Preservation Society of India, 7, Astley Hall Dehra Dun. The list will be published in "Cheetal" also.

The Society shall be grateful to all sending such information.

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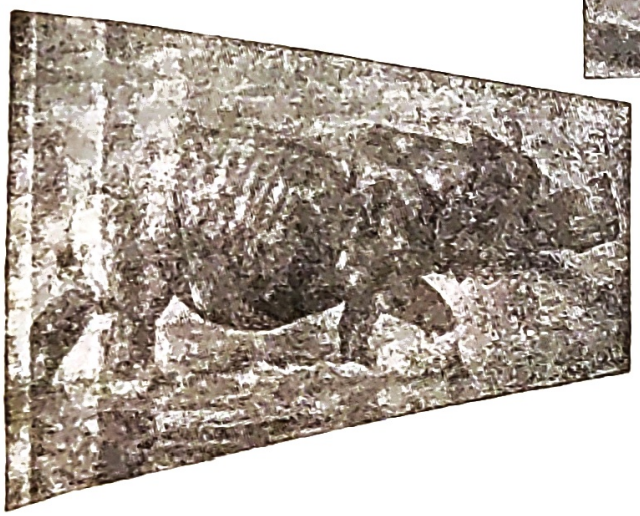

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CHEETAL

Journal of the Wildlife Preservation Society of India

Vol. XXIV | September & December, 1982 | No. 1 & 2

Wildlife Preservation Society of India celebrates its Silver Jubilee during 1983

The Society was founded by a group of Wildlife enthusiasts in 1958. The moving spirits behind its foundation being Maharaja Pratap Singh of Nabha, the first President of the Society, Shri P.D. Stracey, Director of Education, FRI and Colleges, the first Executive Vice President and Shri J.N. Uniyal a forest officer who became the first Honorary Secretary. The Society has rendered yeoman Service to the cause of Wildlife conservation and is now internationally known. It hopes to grow from strength to strength and to serve the cause of Wildlife and Environmental conservation.

* * *

Honourable Shri Digvijay Sinh—a Life Member of the Society and Minister for Environment Government of India—addressed the members ahd Guests of the Wildlife Preservation Society of India at Dehra Dun Club on 22nd October 1982.

The President Maharaja Pratap Singh of Nabha welcomed Shri Digvijay Sinh and the Honorary Secretary gave a brief account of the work of the Society.

* * *

Shri Digvijay Sinh addressing the guests and members appreciated the work the Society has been doing for the past quarter of a century and exorted the audience to work hard for conservation of Wildlife and Environment which were seriously endangered.

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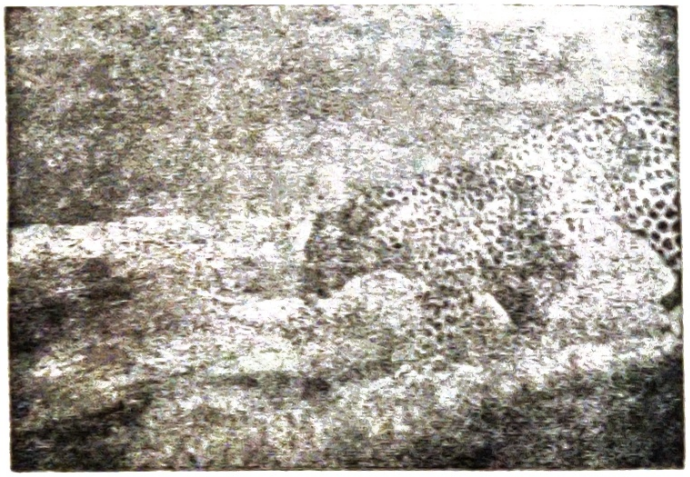

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The Story of Khairi (not a mere tigress)

By

S.R. Choudhury, I.F.S.

(Continued from Cheetal, Vol. 23 (4), Page 49)

Jambo, the bear does the opposite of Beda. He eats by sucking without mastication. He has the softest tongue in our family except perhaps that of Bajra the toothless pangolin otherwise known as the scaly ant eater. But Bajra has a different kind, a slimy long one to probe the tunnels and pull with it into his mouth the ants who get stuck en mass. Jambo's soft tongue helps in sucking his food. To make it easier still he does not have the middle two front teeth in his upper jaw. Its mechanism is very intriguing when one tries to reckon how his wind pipe and food pipe work together to draw and put the food into his stomach while the wind goes into his lungs without any choking.

At the gap of the missing teeth Jambo puts the pliable tip of his tongue perhaps as an inlet control. The thick and elongated lips join to provide a versatile nozzle. Jambo uses full lung power to suck, so much so that after digging open an ant hill with his heavy foreclaws he places his snout, the nozzle, on each tunnel and applies repeated loud pulls with his lungs. He takes one after the other till he is through with the ant hill when much of its inhabitants are aspirated from their myraid tunnels and transferred into his marauding tommy. Put a bowl of porridge to him. One whole litre bolts in with just twenty-five slurps, clean through his gullet.

While gathering his food Jambo finds no time to masticate like Beda does. He finds it easier to scoop the apples and guzzle the scrape than bite them to eat. After each feed he usually lies on his side and puts his left palm, thumb side, into his mouth. He then starts loud humming, continuously, while he vigorously sucks his palm and gulps the saliva. From the sound itself I had suspected in the very beginning that he was simulating the buzzing of the bees. I have taped both the sounds, of Jambo and of the bees. When played together they do resonate to confirm my suspicion. Quite often while making that sound he also moves his right palm in the manner of clawing the ant hill. Honey and ants are his top palatable food. Sound of the honey bee should make his mouth water. Simulated clawing of the ant hill adds the booster. It is not the 'bear fever' as is popularly said about the drone of the bear, nor is it an expression of the acme of pleasure as is supposed by some scientists. It is a very important physiological necessity of the bear who does not masticate his food. In replicated experiments I have prevented his salivation by keeping him otherwise engaged after he has had his fill. Within hours he has invariably passed the marked food out, undigested, in loose motions. The acquired human habit of chewing the gum and more popularly in my country, the 'pan' made from betel, produce saliva and promote digestion in

similar manner of what is innate in Jambo the bear and Beda the boar. Many of our friends and relatives have taken the hint and applied the Jambo-Beda principle after each principal meal. All have felt the difference significantly for the better. Some of them who had been taking a number of antacid tablets every day do not need those any more.

Rumination or 'chewing the cud", which Arkhita the barking deer does in the manner of all ruminants, involves the fast gathering of food in the paunch. But unlike the bear, the ruminant regurgitates it in small mouthfuls for thorough mastication with saliva. In the intervening time the bacteria in the rumen interact to break the cellulose in the forage and detoxify some of the toxins which may be otherwise harmful to their host. Arkhita collects his fodder within a short time and later goes to a favourite place to ruminate.

Bilu the large Indian squirrel nibbles and chews at the same time. Thekku the rufus tailed hare is less elaborate in mincing and masticating. He belongs to the same family as the rabbit, the lagomorphs. They are offophagous or the offal eaters. In its first passage through his guts, Theku's food is processed and vitamin enriched by the symbiotic bacteria in his caecum just before it is excreted out through his rectum. Unlike the rumen bacteria who process the food at the beginning of the digestive system, the caecum bacteria do so at its end. Theku has, therefore, to reingest that excreta and recycle it through his digestive system again to assimilate its vitamin rich nutrients before the final elimination of his faecal pellets. We see to it that he has all the scope to do so undisturbed. Else, he will not survive. We have, incidentally, also observed that our hare who is supposed to be a pure vegetarian does eat the dead frogs and the meat, leftovers from our crocodile pools. He does it in the company of our lesser cats, civets and mongooses.

Bhaina the hyena has mountain shaped molars with sharp pointed tips. He can crunch with ease the thick and heavy bones that Khairi discards. His tongue has a moderately abrasive surface of small spikes with which he can clean off the pulp from a ripe mango or lick the softened flesh clean from the bones of the dead. He belongs to the tribe of true scavengers indeed, but he does have a sweet tongue too which Khairi had only when she was a young cub, not when she grew up with those dense thick barbules all over her tongue excepting only at its tip. Salt tastes at the outer end of a smooth tongue, sweet on the middle and sour at its back. Adult Khairi does appreciate the taste of salt when added to not very palatable meat.

Chhabi the python has a reptile's digestive capacity, all in her stomach, to deal with even the furs and the feathers. The goat she had swallowed had been caught and held in her saw toothed jaws and then coiled round and round with her body to suffocate and kill before swallowing the whole goat. We give her live chickens. She ingests them the same way she had, the goat. The small wolf snakes in our rest house compound catch the skinks and kill

also by constricting like the python does. Chhabi takes a whole chicken, 750-1000 gms; once every two to three weeks. Three to four days after that she eliminates the residue of the fowl in finely particled white lumps, consisting mainly of disintegrated bones. Kumbha the young crocodile digests in the same way as Chhabi. He cannot constrict. He just jabs his prey dead in his powerful jaws, mashes with a few more bites and then swallows.

Clip-clip-clip, chop-chop-chop, crunch-crunch-crunch, munch-munch-munch, slurp-slurp-slurp : that is how it goes on with our animal children, most of them active in day time, some like Ti(n)aw, Theku and Chhabi at night and others like Khairi and Arkhita, in the morning and evening hours. The interrelationships of all these distinctive and specialised ingestive behaviours of the digestive systems in the animal members of our family are revealing in their possible interactions in the mosaic of food chains and webs in the natural life systems that house the tiger and provide for it.

In our multispecies family Khairi is the true carnivore who eats only raw meat and at times milk. Arkhita, the barking deer is a pure vegetarian. All the others including us are differently graded omnivores. Like Arkhita, Manika was also a true herbivore. After she grew to favour more of greens and depended less on milk she used to go out and browse the compound of the rest house. Sometimes Khairi stalked to take her by surprise. But she never could. Every time that nimble toed fawn beat the big tigress hollow in the game. Manika would bounce off in a few leaps and wait for Khairi to catch up, and as she came on, the fawn stood still, teasing in her look the tigress to buck up. The next moment Manika flew, her hooves hardly touching the ground and Khairi chasing hard to catch up. The fawn would then take the tigress once or twice round the rest house before she rushed into the rooms through the back door, straight into Nihar's lap on the bed. Close on her heels would come Khairi rocking the beds, but only that far and no more. Nihar would not permit her to touch Manika. Sometimes, when Manika did not find Nihar on the bed she would cry out in similar to but smoother than the call of the barking deer. And then she would slump in her bunk resigned to Khairi's designs. With no one to stop her, the tigress usually took the fawn in her jaws by the small of Manika's back and walked out to the lawn. There she would put her on the grass and start licking all over her body. Manika appeared to enjoy the treat.

In those days, sixteen months old Khairi was smaller by a third of her full adult size. She weighed only 123 kg. on December 27, 1975. She slept then on the double beds leaving enough space for me and Nihar to squeeze in on either side. Sometimes Manika too crawled in by my side, under the blanket, and lay there putting her chin on my chest. If she came and lay on my side nearer Khairi the tigress would roll closer and put her warm soft paw lovingly on the fawn. How nice and sweet of her it really was. Moments of all memorable

moments, those are among the ones which come back in all their vivid life when I recollect them now, five years after Manika was suddenly no more.

Late one evening, December 29, 1975, Nihar was writing in the bedroom. It was time for Manika to be in her bunk and Khairi on the beds. But neither of the two had turned in yet. Came then first Manika in through the dining room. With one long high jump she landed near Nihar on the bed. When she failed to draw her ma's attention, the seven months old fawn jumped down and settled in her bunk. A moment later walked Khairi in, she too through the same dining room. While climbing up the beds she saw Manika in her bunk. And, she also saw Nihar engrossed in writing. Before Nihar could move to stop her Khairi had grabbed the fawn and bolted away through the front door. I heard the hue and cry. No one dared follow the tigress melting into the dark inside of the western side grove. I snatched the flash light from Khairi's log keeper and ran after her rushle. At the far corner of the fence I got passing glimpses of the tigress. When she found that I had cornered her, she tried to hide behind a bush. I moved to my right and caught her in the light. Manika was dangling in Khairi's jaws. Both were looking in my direction, the tigress with annoyance, the fawn in innocence. Shouting at Khairi I rushed towards her commanding her to leave Manika. Without dropping her quarry the tigress ran, instead, out into the open grass. There she turned to face me. When I came closer she put Manika on the ground and squatted near her on all fours.

"Leave, leave Manika and get out of here, you naughty, leave her alone, or I smash your head", I continued shouting till I came and stood close to her face. The tigress sat there, obstinate, resenting with low growls my interference in her game. But I knew better. Without any more arguments came the metal torch in my hand down with a loud thud on her head. The tigress lept back. Gathering the fawn into my lap I ran and handed her over to Nihar asking her to see if anything serious had happened. And then, picking a thick long staff I ran back to find Khairi. She was still in the open. When she saw me with the stick she shuffled away towards the grove. I gave her a fast chase. She ran round and round, in and out of the grove till I myself was out of breath. I threw the stick at the receding posterior of that tigress and walked back to the rest house. Nihar was standing on the verandah holding Manika, head up, in her lap. The fawn looked into my eyes perhaps asking, "What happened to Khairi, papa ?" Taking her in my lap I assured her that I had chased that naughty tigress far away into the woods. She would not dare come back to disturb her any more. In talking to Manika I was trimming down my own annoyance with Khairi.

Nihar told me that although Manika did not sustain even a scratch, she did, however, appear to have got a catch in her neck. I massaged the fawn's neck with Iodex and on it applied the dry foment. By bed time she was her ownself again and on her own she went back to her bunk.

Came then Khairi to the bed, silently with a long drawn face and lay on it without announcing in her usual way that she had come. She did not even turn her eyes to check on Manika. She had certainly not intended any harm to her friend. The tigress was, therefore, not in a mood to talk to anybody. I could see that. And so, I too did not say anything to her.

The following day, Khairi did not come near Manika. We had in the meantime moved Manika's bunk from the bedroom to the sheltered far side of the dining room. Late next morning, on December 31, Khairi came to search for Manika in the bedroom. When she did not find her there she entered the dining room and picked the smell of her friend. She then went straight to the fawn and started licking all over her body, perhaps asking her to come out for a round of run-and-chase. Manika was in no mood to play. Khairi left her alone and went out.

That evening Manika had returned to her bunk in the dining room after a short stroll outside, before sunset. Khairi came in after dusk and lay on the beds. She would not then take any meat unless it was held, each piece to her mouth, by her ma. I told Nihar to bring Khairi's food. While Nihar was preparing to feed her, the tigress stood up to go. We thought she was going out for some fresh air as she sometimes did. Unfortunately, we did not know that the far side front door of the dining room, which used to remain always closed, had been left open by some one, perhaps while sweeping that room. Immediately after Khairi had gone out Nihar saw her entering through that door, and as she saw, she screached a chair towards Khairi to scare the tigress away from the fawn. Alas, it was too late and too far, with the dining table standing on the way. Khairi grabbed Manika and whirled to leap away. Manika held in Khairi's mouth hit the door.

I chased the tigress. She stopped and turned to face me at the outer edge of the drive circle. When I came closer she put Manika down on the ground and ran away. I picked the fawn and holding her tight against my chest, her head drooping on my left shoulder, I rushed into the bedroom. Manika gave a few spasmodic kicks in the air and then went limp, her legs dangling loose. I knew, the worst had happened ! Nihar would not accept that. She put the fawn's muzzle into her mouth and started blowing into her lungs, hoping against all hopes, praying to revive her very dear little Manika. I put the torch on the fawn's eye and showed Nihar the dilated pupil which did not respond to the light. Manika was dead. That cruel truth had to be accepted.

I called for a tray. Placing the dead fawn on it I put it on the bed. And I sat beside it in silence, waiting for Khairi to come. I knew she would, to see Manika which she did in a couple of minutes. Came gently up the beds and lay on her belly slowly pushing forward closer to the tray. And then, suddenly standing up she placed her jaws across Manika's shoulder and lifted her to make her stand. It was not very different from what Nihar had

done in blowing through the nose of that dead fawn—trying to revive her. I told Khairi firmly to stop meddling. She released her grip and settled on her belly again. But then, she did not stop altogether. She started pulling at the hind legs, nudging Manika to wake up. I told her repeatedly not to do that. She did not pay any heed to my words. I lost my temper. I should not have. But I did, unthinkingly in my deep distress, unthoughtfully blaming Khairi.

I pulled the wooden rod out from the nearest door screen. She took the first across her shoulder and rolled belly up to get the second on her chest and chin. The rod broke in two. I waved the piece in my hand and shouted at her to get out of the room. She scrambled up growling and leaped opposite, to the mirror table. Standing on it with her haunch held high and shoulder leaning low she looked towards Nihar while she continued growling at me. Nihar opened the front door, and as she did, in one long leap from the table the tigress was out through that door. Nihar took the meat and followed her a little later. I checked the neck of the dead fawn. It had snapped at the occipital joint, evidently in that hard jolt against the door. Khairi had meant no harm to Manika. It was an accident. She was not to blame. I went out to find her.

Prior to that, every time Khairi had had a beating from me she had not talked to me for at least half an hour. Often she had gone to find comfort in her ma. Or else, she had walked away some distance and lain there on her belly, her chin put across her left arm, her face longdrawn, her eyes frowning away from me. Later, she had invariably come back to me on her own to beg for compromise. Putting her both arms round my legs she would mia-n-ow and coo-n, interspersed with prusten, like she would speak if she could, "Papa, let's be friends again".

That night I went out to find her because I wanted to make the first move for compromise. I was feeling sorry for the undeserving beating I had given her. I found Nihar feeding her in the lawn inside the drive circle. As I approached them, talking softly to Khairi, the tigress stood up and started slowly walking away from me. I followed, continuing my talk with intermittent prustens. She was in conflict, apparently ambivalent, to stop or not to stop. Perhaps I did not give her sufficient time to resolve her conflict. For, as I got closer she studdenly whirled standing on her hind legs and swiped her right forepaw in the air close to my chest. One of her claws caught the front of my tweed coat and ripped a patch open. I was close enough for her to hit me squarely on my left side. If she had, I would not be telling her story. She never will, for she does love me dearly. And so, she did not.

I turned abruptly and returned to the bedroom. Nihar came a few minutes later after feeding Khairi. Within a couple of minutes came Khairi in. As she entered she looked at me first and prustened. I took her face in my hand and fondled. She then went up the beds.

Manika was still lying there, in the tray on the bed. Khairi saw and stretched herself near the tray. She put her right paw on Manika and looked at her a long contemplative moment before she closed her eyes to sleep. A few minutes later when I tried gently to pull the tray, Khairi pressed her paw on it without opening her eyes. I repeated a few more times eliciting the same response. Ultimately I had to snatch it away. Khairi opened her eyes. She saw me covering the still body of Manika with the floral scarf of Nihar which she had brought from Manipur. That scarf had been little Khairi's favourite wrapper, the previous winter. With the onset of cold in 1975 Manika had taken possession of it. After covering her dead body—we could never think of her as a carcass, our mute child—I put the tray on a high stool. Khairi kept looking at it for a long while before she finally closed her eyes to sleep.

After dinner I took a lamp and settled on my belly on the bed to write the diary. Khairi moved closer to my side and spreading her right arm and leg on my back she tugged her face under my left armpit. Soon she was in deep slumber. I heard her whimpering and felt the twitching of her face. She was dreaming. I wondered what. Was it Manika ?

Three hours later, at past midnight, she suddenly woke up with a start and went to the corner where Manika used to lie in her bunk. She sniffed that corner and walking opposite checked near the frige. And then she came up again to sleep on my right. Mosquito nets had been discarded long back with their messing up in the young cub's claws. She could move freely up and down the beds. Putting her face in the shade of the lamp she squeezed herself, doubled up, on my leg side.

One more hour later I switched the lamp off and stretched on my back to sleep. Khairi put her arms round my left thigh and pulling my leg to her chest she snuggled up closer like she used to as a young cub sometimes when she had chosen to sleep with me. I know it was the soothing touch of her dear papa which she needed for solace. I knew she was missing Manika the same way we felt her loss. I put my hand on her face and gently caressed her till I drifted into deep peaceful sleep.

Early next morning, before bed-tea, Nihar had got up and organised the digging of Manika's grave. While handing me my tea she told me that all was ready. Flowers had been sent for. Khairi had gone out much before Nihar, without greeting us. I wondered if she would come to attend the burial of her friend.

The New Year's first sun was peeping over the sal trees when I took the tray to the front side lawn. A simple small tent had been pitched on the gate side of that lawn. The grave had been dug close in front of the portico, her favourite place where she used to chew the cud. I put the tray in the sun and lifted the scarf from Manika's face. Khairi

came from the western side, along the fence, to the gate. She then leisurely strolled into the tent and lingered there in. I went and told her to go and see Manika before her burial. The tigress went out through the way she had entered that tent and slowly walked along the bedroom side edge of the lawn till she came and stood about a metre away from the tray. There she settled hindwards on her belly, her limbs lying forward, her face turned towards the grave. Came then Bagha from the eastern side and squatted near Khairi. After a couple of minutes I told Khairi to come closer to Manika. A wee moment later she stood up and walking up to the tray she put her nose to Manika's face, neck and legs. She smelt the scarf and once again the face of the dead fawn. And then when she lifted her head she walked away, facing the sun, without even once looking back, till she went behind the trees at the far eastern corner.

With silent prayer in the agony of our hearts we lowered Manika covered by her Manipur scarf, to the padded bottom of the grave. Nihar put the fawn's favourite brinjals and the beans and on top of those the flowers. The grave was closed and on it was placed the fawn's empty wooden bunk, up side down. It was finally mud pasted to mark the grave. Months later, after the grave had settled, we made a masonry gravestone with her name on it in Oriya.

The New Year's Day of 1976 was a sad one for us. The bedroom corner near the bathroom was clean. That had been the faecal corner of Manika. There she had been defecating regularly in the morning. We had kept watch on her tommy by checking on her faeces. Dry, dark pellets meant good digestion, in perfect health, and so indeed she had been the previous day. And then that sudden vacuum to which Nihar could not adjust that soon. In routine manner she looks at Manika's faecal corner, and absent-mindedly called her a few times during the day. In the evening we talked about Manika and about Khairi. I told her particularly about Khairi whom I had watched during the day. A little after mid-day she had come alone and sniffed all round the mud plastered grave of Manika. She then came into the dining room to the same place where she had licked the fawn the previous day in her bunk. Every time Nihar had involuntarily called out, "Manika", within Khairi's hearing, the tigress had invariably come in to look for her friend. We rationalised our depression in the exchange of our thoughts and in talking about our feelings. There was no way to make Khairi understand. She continued to search for Manika through four days, with decreasing frequency till she finally gave up. It happens in nature. Khasri's own mother must have done the same: searched a couple of days for her cub in the cave and in its vicinity before giving it up as lost. That, however, may not mean that they forget altogether. Khairi at least does not. She has not made any mistake in recognising her aquaintance whom she has met after two-three years. When she meets them after long intervals she usually confirms

her visual recognition by their individual body smells. Her nose discerns more confidently perhaps than her eyes and equally so do her ears.

Her discerning ears could lead her back to us when she had lost away, the only time she had had, in all her many campings out with us in the Similipal forests. On April 11, 1976 we had taken her for the first time to Kairakacha camp house in the interior of the core area of the tiger reserve. We arrived there late in the afternoon. Nihar got busy in arranging the camp. Khairi went out for a stroll in the near surround of the camp house. I followed her with her log keeper Prof. Paul Leyhausen and Dr. Colin Holloway of IUCN/WWF also came with us. Khairi returned to the camp house after sunset and was fed by Nihar. She then went about 30 m up the hill slope to the north of the camp house. There she sniffed a patch of level ground and lay on it, overlooking the open pavilion in front of the camp house. Paul and Colin left after dinner. I and Nihar drew our camp beds out to the pavilion.

In the small hours of the morning, 3 O'clock by my watch, Khairi came and cooed us awake. Standing in between our beds she first brushed her cheeks on Nihar's. She then turned her face towards me and placed her lips on mine, prustened and then walked slowly away towards Chahala. It was her usual way of greeting us before she went out for her prowls between 4 and 5 in the morning. That morning she went out a little earlier, understandably because it was the first day of her first camp at Kairakacha, and more so because she had returned four long months after her previous camp in those hills. She was twenty months old, almost full grown. She would be able to hunt on her own. She knew its technique from the womb. She had been practicing in playfully on us and her other friends—stalking steathily, keeping off her own wind and catching us by surprise. Khairi was perhaps out to look for the real game. I heard the scare call of the barking deer from the western side. I suspected it was barking at our tigress.

Two log keepers had followed her at a distance. Half an hour later they returned to tell us that they had lost track of Khairi. They told me that after leaving the camp the tigress was taking a belly dip in the Kairakacha river. They watched and waited on the back All of a sudden she picked some smell from the opposite bank, hurried up and vanished in to the thick cover. I knew she had gone after the barker. I told the log keepers to wait : "We will find her in the morning".

We could not find her in the morning, nor the day through till late evening. I and Nihar searched for Khairi over miles all round Kairakacha. The day dragged on, increasing our anxiety. Nihar cried often in distress. I too did, at times, feeling depressed.

A ground fire came at noon from the west and spread to the south. It could ultimately be controlled by evening, on the Chahala-Jashipur road. Many animals were seen moving away from that fire. There was no sign of Khairi. We felt more and more disheartened.

That morning on my way back from Chahala, after seeing Paul and Colin off, I had heard a gun report from the southern side. Khairi had gone in that direction towards the villages. When she did not return till so late in the dark, I remembered about the gun shot and felt much concerned in thinking that she might be its victim. She had never lost her way in any of her previous camps with us in Similipal. A cat orients with the three dimensional impression of a known territory. In new land it has to gradually build up the impression which Khairi had done in each of her previous camps elsewhere in Similipal. The impression is not only visual but equally as much olfactory. At times when Khairi had gone out any far alone for the first time she could even smell her way back to those camps. She should have been back with us at Kairakacha, if nothing else, at least for her food, but she had not, and on top of it was my thought about the gun shot. All we could do then was: pray and wait for the search again in day light.

We did pray earnestly, and we did not have to wait till the next morning. A little before midnight three jeeps drove in from Chahala side. Among those was one of our project jeeps known to Khairi. In that came my good old friend Auodh Narayan Tiwari with his Minister of Tourism, the Minister's P.A. and Bijay Kumar Swain, one of our project officers. They found us crest fallen, swollen eyed. All of them felt very sorry in hearing about Khairi. Before bidding us good-bye A.N. told me very confidently that Khairi must be alive and she would for sure be found soon. It was very heartening to hear him say so, and indeed it did happen soon enough. Half an hour later he rushed a jeep back to us : he had located Khairi.

We were so happy. Nihar hastened to put the meat basin and the water container in that jeep. Within minutes we reached Tiwari waiting for us on the road. We did not see Khairi. Nihar got down from the jeep and walking a few steps away from the road called, "Kha—ee—ree—Kha—ee—ree, Khairi aa (come)".

On hearing her ma calling her, the tigress came leaping over the bushes at 0147 hr as recorded in her log. She came and rubbed her cheeks and brushed her ruff on Nihar while she voiced her happiness in endless chain of maas, mianows, aanoos and kuuns. A mute animal, but how clearly did she not convey her feeling to her human mother, like almost sleeping to her, "Ma, my darling mummy, I am so, so very happy to be with you ma". All of us watched amazed.

Nihar fondled Khairi, happily talking away more to herself than to her tiger daughter. She then asked her to come with her for her food. The tigress understood and followed.

She was going to have her food thirty hours after she had had her last, two evenings back. While she was being fed by Nihar—logged 0150 to 0158 hr—all of us stood by for a photograph. Tiwari then narrated their adventure with Khairi.

They had been driving straight through to Nawana. Our project jeep was leading. In it A.N. and his Minister were on the front seat. The Minister's P.A. and Bijay sat on the rear. After bypassing Chahala they had hardly covered 1½ km of the plain stretch when they saw a tiger coming out to the road from the left side. They stopped torpid, their limbs going loose on seeing that tiger so near the jeep. In their fear the animal looked much bigger than Khairi. Bijay, however, took a chance and called, "Khairi, Khairi". The tigress looked towards his call and came close to the jeep. She walked along almost touching Tiwari and went round the back side prustening to Bijay and then approached the driver's side. The driver had already promptly vacated his seat. Tiwari and others got down, but not the Minister. Khairi climbed up from the driving side and lay on her belly, her face almost touching the Minister. Tiwari told him to slowly edge out which he did. The tigress remained sitting there for a little while and then came out to check the jeeps. In the meantime, A.N. had asked the rear most, third, jeep to speed back and inform us. Khairi met every one of them standing together. The Minister's P.A. tried to avoid meeting her by moving behind the group. The tigress trailed him three rounds before she gave up in disgust.

She had come to the road on hearing our project jeep. Her ears could pick and recognise its sound out of the three running vehicles. She checked the vehicles. She met its occupants. She had expected to find us. She did not. Disappointed she went back to where she had come from, perhaps where she had lost track of her quarry, that barking deer, twenty hours earlier. From that point Kairakacha camp is hardly a kilometre across the first peak of Gilda hills. Khairi lost her way so near the camp because, in the intense concentration of her eyes, ears and nose while stalking the barking deer she did not pick any impression of the track she traversed and that too in unknown hills into which she had gone for the first time.

Although a vehicle had come from our camp to take us back, Khairi preferred to walk the 2 km to Chahala, reaching at 0247 hr. There, she first lapped water 176 times, nearly one litre in 58 gulps, and then took the remainder of the 5 kg meat. We stretched ourselves in the open while Khairi rested after her food. Two hours later at the crack of dawn she took us on a short stroll of 4-5 km on the southern and western side of Chahala before turning east, 4 km to the Kairakacha camp.

"Once bitten twice shy", Khairi did not go out anywhere for full three days. She lolled a good lot in the crystal clear pools of rivulet Kairakacha Nadi and its feeder stream, Champa Nala. The latter murmurs down from the south-west to join the former close by, hardly two dozen steps from the camp house. On April 14 night, a sounder of swines came

near the camp site. Our tigress lying then in the pavilion picked their smell in the north wind and was out in a flash, trailing them up the Gilabeda hill. I followed her with an electric torch and brought her back after half an hour. Next day she knocked about a little in the proximity of the camp. The following morning, on the 16th, she started her systematic prowls to mark out her territory. In crepscular outings daily two to three hours this side and that of dawn and dusk she had exploratory loops 3-4 km deep across the range of hills all round. Before the week was out Khairi had full grip over her Kairakacha territory. Never again did she miss her way in those densely wooded hills. Her faculty of finding her way about was very remarkable on April 29, night.

That night Khairi was sleeping in the open, on her camp bed placed near the pavilion. It was nearing 11 P.M. I was still in my field dress. All on a sudden Khairi jumped out of her bed at 10.40 P.M. and rushed out towards the east. I followed, hastily picking an electric torch. The tigress was after the wild elephants, three adult females, two calves and one baby. Khairi's ears which remain alert when she is asleep had apparently picked the approaching sound of those elephants, the reason why she jumped out of the bed. I caught them up on the southern slopes near the camp house. The elephants were shuffling fast, Khairi following in true feline style across the Champa Nala, over the Machine pahad hills and down to the Kairakacha Nadi where one of the cows lost her foothold and rolled to the Nala bed. She quickly got up on her legs and climbed up the far side bank running away from our tigress. Khairi took them a full round west-through-north of the camp and then continued chasing them towards the east in the direction they had come from. One hour later at 11.45 P.M. those elephants crossed a deep pool in the Kairakacha Nadi 4 km away from the camp house. After seeing those elephants beyond that pool, Khairi settled in it and later had a good swim. I had caught up with them mainly by my ears, the electric torch leading my steps. But for that lighted torch in my hand I might have stepped on a highly poisonous two metres long snake, a banded crate who the elephants and the tigress had stepped across without misstep.

Khairi came out of the water after five minutes and then walked leisurely back towards the camp. I followed. Now and again she would stop to look back and ask unh-unhing if all was well with me. She found her way by her strongly nocturnal eyes with intermittent confirmation by her more efficiently discerning nose. We crossed the nala three times. After the third she stepped aside through unbeaten track to one of her favourite beddings, about 3-400 m from the camp. There she slumped to sleep at half an hour past midnight. I too did, placing my head on her belly. She woke me up at 6 in the morning and came to the camp to greet her ma before going out again for her usual early morning prowl.. Next day we returned to Jashipur.

Khairi Jashipur
November 1, 1980.

S.R. Choudhury

Cheetal—Vol 24, No. 1

Chemical Senses (Sense of Smell) An Important Means of Communication Between Tigress And Her Cubs

By

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Introduction

Many times a tigress has to search for its cubs to join them after they have run-away because of some disturbance or danger when the danger or disturbance persists and communication by sound is not possible, because the female wants that her presence and specially the location of its cubs should not be exposed or the reverse could be the case when cubs want to visit the female in similar circumstances, then the female and cubs have to depend on some other means of communication than sound. It has been proved beyond doubt that sound and smell can allow communication over a long distance and these means of communication have the added advantage that they can travel fast and also can pass through natural obstacles. Chemical communications are well developed in insects and mammals.

Methods

There are two females one having four cubs about 6-7 months old and other having about 20 months old cubs. I have an opportunity of watching them for number of times. I observed that whenever the females go for hunt or are preparing for hunt, they do not use sound as means of communication but still the female and cubs are able to follow each other even when they are at considerable distance and site cannot help them in locating their mother or their brother or sister. Stiil they do not miss each other and even could meet after travelling a distance of 1-2 kms. Here is the detailed information about the experiment conducted by me.

(1) I had a chance siting of tigress at 6.30 P.M. just at the triangle near Milak Talab and in the middle of the road. I immediately stopped and kept sitting calmly for watching its behaviour. I was knowing that this female has got 20 months old cubs, so I waited for the cubs to join their mother. The tigress was sitting very calmly. The road was at higher altitude and both sides was a low level land, towards the left side was the Milak Talab Lake and towards right side it was just low level grassland and there were number of spotted deer grazing by the side of the road in this grassland. We kept

watching up to 7.00 P.M. when she got up and moved in zig-zag way urinating (marking) at every big tree it came across. First it followed the road and thereafter it moved in a small Nallah and then followed it for about 1 km and again sat quietly. Now we just took our Jeep behind a tree and with the increasing darkness we were reasonably camouflaged. At 7.30 P.M. cubs were seen coming from the low level grassland side and one of them first went to the place where their mother was sitting sniffed the ground and then moved exactly in the same Zig-Zag way and touching all the big trees where their mother had urinated...I obstructed deliberately in the mid way but the cub did not change its behaviour. Other cubs were just within the siting distance of each other and were following leisurely and all ultimately entered the same Nallah in which their mother has gone and at 8.30 P.M. we saw that the cubs were with the mother. There was no other source used as means of communication throughout the observation period.

(ii) In the evening I went for the drive and I saw female with four cubs about 6-7 months old sitting by the side of loose stones on the slope of a hill which comes immediately after Milak Talab when we go to Lakarda. We saw this family in the late hours of evening. Hence with the approaching darkness we returned to the Forest Rest House. In the night we came to know that an animal has been killed by this family. Next day in morning at 7.00 A.M. we went to the site and we found that female and all the four cubs were there and at about 7.30 A.M. as soon as the Jeep of the Field Director started after completing their observation all the four cubs ran away. Incidently they went in the direction towards which this Jeep was to go, so all the cubs went to a long distance and were perfectly out of site of the female. The female was still feeding. We too left the site slowly and immediately we could locate the point from where the cubs had crossed the road and except at this point there was no sign of pug-marks nearby. I intentionally did not go to the other point because that may effect our experiment. This was right time to experiment. We again went to a point just nearer to the earlier site and we found that she was still feeding. At 8.05 A.M. she left the kill and moved fast in the very ZIG-ZAG way with the head near to the ground and sniffing. This was a clear sign that she is probably following the movement of cubs by smell, otherwise she would have more or less followed a better route, siting of pug-marks was difficult in the grassland where she was moving. I immediately reached to the point from where the cubs had crossed the road and just stood with the Jeep with the intention that if she is not following the route of cubs she will definitely pass through some different route which was easier and shorter. We could watch her ZIG-ZAG movement also from this point. She was surprisingly moving in a peculiar way and irrespective of the fact that she could have avoided us and also could have taken a

shorter course. She followed a longer route and just crossed us at a distance of 18′ and immediately again went in that very manner of sniffing the ground and moving. Now I again went to the route which I could see from distance and found that she was following the same route which her cubs had followed with a deviation of 5′ to 10′ each side. This was confirmed by the pug-marks of females and that of cubs. At 10.15 A.M. we found that female and cubs were again together without facing much difficulty.

Conclusion

This way I conducted two experiments, in the first case I tried to obstruct one of the cubs to follow that marked route and in second case I obstructed mother to follow the route on which probably the cubs had left some smell, but the mother as well as cub in both the experiments decidely followed that defined route without bothering about my interference because in both the cases once a loss of marked route may result into the failure of the re-union drive of their family. In the two cases the female did not make use of any other sense for communication except that of smell.

It is my common observation that once the female has made a kill, she makes use of sound as well as smell as a means of communication, otherwise for most of the period the means of communication when they are on move is sense of smell. This way they communicate without exposing their presence to other species.

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Immobilising A Trapped Man Eating Tiger

By

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On August 1, 1981 the man eating tiger of Bangajhala (a place 5 km from the boundary of the Corbett National Park) was captured in a box trap. On receipt of this information the Field Director, Project Tiger, Mr. C.B. Singh (who had meticulously planned the entire strategy of the capture) and myself along with the field staff rushed to the place of capture from our camping site at the Garjia Forest Rest House.

On seeing us on the elephant's back the tiger became highly agitated. The beast showed its aggressiveness by roaring continuously and hurling itself against the bars of the cage. A quick discussion followed and it was decided to immobilize the tiger in order to prevent any further serious injury to it and for its safe transportation for the arduous journey to Lucknow Zoo which is around 450 km from the place of capture. It was decided that 3-4 elephants should be parked right in front of the cage about 4 m away and people should keep on talking loudly so that tiger's attention was pivoted and concentrated on the elephants while myself along with a Forest Guard would approach the rear of the cage. The strategy was followed and I was able to reach within a metre of the tiger's rump for close darting and when I darted the tiger except for a minor twitch the tiger kept his attention on the elephants and never realised that it has been darted.

The projectile syringe containing 10 ml ketaset with a 3 cm barbed needle was fired at 11.30 A.M. by a Dist-inject (Mod. 30) pistol using a yellow charge. The drug dosage and other allied information is given in Table 1.

Within 7-8 minutes the drug effect was quite visible yet the desired level of it was not obtained as the tiger was still vocalising and trying to gnaw at the bars of the cage. A second dose of 5 ml ketaset was administered again after 40 minutes. Gradually the drug effect was observed as progressive ataxia, head weaving (due to which the tiger was pushing its head against the bars of the cage), increased salivation as also the licking movement of the tongue, occasional excitement (Like swiping at the bars with its fore paws) and a glazed expression of the eyes.

As the tiger was still showing restlessness intramuscular Diazepam was given by a hypodermic syringe. Diazepam has a wide safety margin, Thomas *et al.* (1967) reported that deer could withstand as high as 1100 mg/kg of the drug. It has also been used for carnivores

Table 1

Species—Tiger (*Panthera tigris tigris*) Site of capture—Bangajhala area, Ramnagar Forest Division. Dated 1.8.1981

Sex—Male. Age—Approx. 8 years. Weight—Approx. 200 kg.

Drugs used—Ketaset (Ketamine hydrochloride) 100 mg/ml, Diazepam 5 mg/ml.

Environmental conditions—Ambient temperature 29°C, sun behind cloud throughout the drugging operation, low wind, continuous drizzle with occasional heavy downpour.

Time of Injection	Ketaset	Diazepam	Dart site and route	Respiration rate per minute	Remarks
11.30 A.M.	1000 mg	—	Left semitendinosus (i.m.)	40	No apparent drug effect even after 15 minutes
12.10 P.M.	500 mg	—	Right semitendinosus(i.m.)	32	Drug effect apparent after 10 minutes
1.05 P.M.	—	40 mg	-do-	20	Took out the previously fired darts
1.30 P.M.	—	20 mg	-do-	18	Hind legs immobile, can move the fore paws as well as neck
2.05 P.M.	200 mg	—	-do-	20	Pedal reflex absent, pupillary dilation
2.30 P.M.	—	—	—	13	Apneustic respiration, animal in steral recumbency.
7.00 P.M.	—	—	—	24	-do-

such as coyotes and foxes caught in foot traps (Balser, 1965). A total of 60 mg Diazepam was administered to the tiger by the intramuscular route using a hypodermic syringe. At 2.05 P.M. 2 ml ketaset was again administered because the tiger was showing signs of recovery. This additional dose of ketaset was given to prolong the drug effect because the tractor trolley in which the tiger was to be transported got bogged down on its way to capture site owing to heavy downpour while negotiating a marshy stretch of land. A slight hyperthemia developed by the tiger was controlled by pouring cold water on it.

Initially it was intended to administer Acepromazine maleate as a tranquiliser together with ketaset but owing to the danger of hyperthemia induced by the drug (Harthoorn, 1976) this idea was dropped. Further extra caution is warranted in case of an excited animal as this drug is adrenalytic and would cause a sudden fall in the blood pressure which can prove fatal.

At 2.30 P.M. the respiration was apneustic and was at the rate of 13/minute. The animal was closely watched at this time for signs of hypopnoea. As analeptic was kept in readiness for any eventuality but this was not required as the respiration was always thoracic and never dropped below the rate of 13/minute. The tiger was in sternal recumbency throughout this period.

At 3 P.M. the rate of respiration increased to 16/minute. During this entire operation no tonic convulsions or bloating was recorded. Salivation was profuse but owing to the presence of normal pharyngeal-laryngeal reflex there was no cause for concern.

The cage was loaded aboard the tractor trolley at 7 P.M. and at that time the rate of respiration was 24/minute. Finally the cage was transferred from the tractor trolley to a truck for its onward journey to Lucknow Zoo at 2 A.M. on 2.8.1981. The tiger remained immobile/groggy for 21 hours and the recovery was smooth and uneventful.

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Redirected Aggression as Observed on a Jungle Crow

RAJKUMAR T. GANGADEB

The following observations were made on the 31st January 1982, in front of our house, in Deogarh, Orissa. Notes taken from my Journal will show the circumstances of my observations.

"A female Shikra hawk alights on the bare neem tree, opens its wings, fans its barred tail, and shakes the droplets of rain water. The tail is deliberately shaken quickly from left to right. Continues drizzling. The wings are still outstretched, giving the impression as if the bird is going through some kind of a dance. The tail is further fanned, the black bands splitting into squares as each tail feather disconnects, detached to dry. Shakes its whole body in convulsions. A slight breeze lifts the feathers on the back, making the bird look ruffled. A Tree Pie alights five feet away from the hawk. Another arrives. Soon a Jungle Crow joins, cawing instantly as it sees the hawk. The Tree Pies take up a chatter. The hawk sits, looking sideways at the birds. The Crow makes a false lunge at the hawk, as if to scare the hawk away. Then with a harsh *kaah*, it hits the branch on its side with beak, holds it tightly in its beak for a second before releasing the hold. One of the Tree Pies decides to come clsoser to where the Crow is positioned, and as it chatters and arrives, the hawk instantly changes position, now facing the aggressors. Soon the Crow flies away, the Tree Pies following suit. The hawk is now more relaxed. Stays in the same position. The tail is fanned partially again, to dry. 4.40 p.m.".

This particular behaviour of the Jungle Crow, *Corvus mocrorhynchos*, is certainly redirected aggression. Unable to attack or bully the Shikra, *Accipeter badius*, a formidable adversary as it is, the Jungle Crow gives vent to its frustration by hitting and holding on to a twig on its side. Earlier, the Crow cawed to attract other crows in the vicinity for 'mobbing' but failed. Behaviour pertaining to redirected aggression is pronounced in mammals, especially among the hoofed animals. Possibly, this sort of behaviour can be found in other species as well, particularly Ravens, Jackdaws, and Choughs. "Some ornithologists rate Crows and Jays as the most intelligent of all birds" (Peterson 1964), a category as it were, among the Passerines. This is a clear case of redirected aggression on the Jungle Crows part.

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Cause of Ageing and Death in the Animal World

Why do animals age ? And what causes them to fade and die ?

S.M. Osman

There are arrangements of certain patterns by means of which the age of not only wild animals but trees as well can be predicted to within reasonable limits of accuracy. Judgement of age factor, in a number of cases, common to plant and animal kingdom, rests generally on the counting of corrugated structures seen as on the horns of a ram, or the annular pattern that grow yearly across the section of a tree's trunk and which denote the exact passage of time the plant has been through. With birds of a certain kind, not merely varying shades of colour, but configuration of spots or streaks on their respective bodies, for the first five or six years of their lives, helps to provide an accurate age estimate.

Among animals of a certain class, ageing conspiciuously changes their colour scheme. In the case of horses of the dapple grey class, it is noted that these gradually grow absolutely white to be later in their old age, get decorated with tiny maroon spots that ultimately cover their entire body. Of course in all matters pertaining to equine age estimation, a much surer way would be to examine their teeth which progressively get worn down in size with declining years. However, the same continuous abrasion of choppers does not seem to hold good in the case of all other animals for in the case of the human animal, the transformation of teeth size, if any, would it seems lie in the lengthening rather than the shortening of grinders with advancing age. Hence the synonym (getting longer in the tooth) is symbolic of old age.

On the other hand, in the world of rodents, the incisor teeth continuously keep growing back to normal size thereby compensating for wear and tear as it keeps occurring, and hence throughout the rodents life there happens to be neither gain or loss in tooth size.

However, regardless of all other indications, ageing even in the absence of colour alteration and tooth size or any other peculiarity in all animals including man, is clearly denoted by yet another significant factor that throws old age into bold relief. In all young animals tender age is significantly Indicated by soft rounded contours that tend to harden and get projected in sharp angular relief as the individual keeps advancing in years. And so it often is not difficult to even at a glance, predict within limits of course, ageing in most cases.

In any situation, identification of age in animals though not difficult for those who are skilled and conversant in the prognosis of this vital factor, fails to explain life expectancy in them, regardless of their varying size or shape. Here an attempt is being made to throw

some light on this enigma, and an effort to clarify the various interpretations of the problem made heretofore.

Widely speaking, the impression that large size in any animal is directly interrelated with longer life, has somehow grown to be accepted by many. On closer examination we find this not to be always correct for it has in countless cases been observed that, even within members of the same family group, there does exist numerous exception to this form of thinking. In spite of the fact that there is a huge difference in size between the cat and the tiger, it is now evident from the annals of sportsmen, who have for many decades at a stretch, lived in the jungles following the fortunes of a wild tiger from cubhood, through young age, till death, that on an average, thirty years would be a correct measure of the beast's longevity. In the case of cats, there are numerous instances where cat lovers have put on record the age of their pets to exceed thirty years. Tigers in captivity very rarely live to a slightly more venerable ripe age. While investigating this occurrence yet further, we discover among dogs, that contrary to popular belief, large breeds have shorter lives when compared to the tiny strains of canine population.

In cases where smaller animals are bestowed with relatively shorter existence, it may safely be concluded that in all such particular instances, stimulus to provide them with a longer more promising lifespan, is lacking simply because predators will not allow them to live and enjoy it. This reality emerges from the fact that there are many small kinds of birds that suffer similar wearing out at the hands of predators but have skillfully demonstrated their ability to go on living for a longer time if properly guarded from predatory harm. Such small fowl when held in captivity are found to long outlive their relations that enjoy a free and unfettered existence in the wild state. This sort of life termination of these birds in the wild frame of their subsistence, could safely be put down to the score of accidental death.

Tortoise is one of the longest lived animals in the world. Tortoise and some fishes come to bear the longest life-spans ever recorded. Their extraordinary long lives are not attributable to their bulk, or weight, but may safely be ascribed to their indefinite rates of growth. We see that growth rate in both big and small animals has a tendency to slow down with waning age, and even in the case of slow growing creatures such as tortoise, towards the later stages of their lives, it is found that they almost cease to grow altogether.

Growth is absolutely vital for longevity. As long as growth continues, old age does not register. By growth is meant some form of biological change in favour of the individual. Once this process gets arrested, atrophy and decay are introduced, finally resulting in death. However, investigations have proved that the time factor for, and the rate of decay immensely vary from species to species.

Analyzing this form of postulation further, it is observed that growth in any form of living being and its usefulness are essential components complimentary to each other. In many kinds of insect-life that are apparently intended by nature, solely for the purpose of maintaining the line of their group, males of the species are dead shortly after mating with the female, and the females in turn die immediately after egg laying.

In most animals, when females are no longer able to bear young, the onset of decay becomes immediately evident. Males that are unable to further procreate, are seen to submissively accept being thrown out of the herd to lead a solitary shortening life. The animal's contribution towards protection of the herd is then progressively diminished, and in this respect also, its usefulness declines rapidly. In short it has no further function to perform and as of necessity must accept the penalty of old age and oblivion.

Earlier it has been mentioned that the rate of growth is related to the individuals shortening or lengthening of life. This is not to be confused with the size of growth for we know how an animal that quickly grows in bulk, like the elephant, seems to make but very modest claim on the allotment of protracted living. Lately many arguments have been advanced in favour of this or that form of thinking. Attempts by sporting investigators have been undertaken to find some interrelation in the time-growth relationship.

Some scientists were of the opinion that the period an animal bears in the womb (gestation), is correlated to its age. The fact that one look at any pregnancy table will prove otherwise, did not seem to bother these worthies much. Gestation in the case of a bitch takes sixty two days; for a cat that is found to live longer than the average dog, gestation period is sixty days only.

Another popular belief put forward by the same school of thought, suggested pulse rates to be responsible for animals leading short or long lives. Pulse rate or respiration bear no relevancy to any animal's long or short life it is seen. Pulse rates in cats and for some kinds of poultry are the same and yet life expectancy in the two cases is seen to differ enormously.

Ambient temperature, it is noticed does have a significant and somewhat direct bearing on the measure of years an animal has to live. The reason for this is obvious, for varying levels of ambient temperature do attain changes in the functioning of any animal's brain such as triggering the onset of hybernation. It is a well known fact that hybernation is induced by a decline in the surrounding temperature. Since hybernation takes place in winter it would be only logical to assume that in order to combat the growing cold mammalian body heat, which at such times would naturally get dissipated at a brisker rate than normal, should proportionately be stepped up so as to maintain correct balance of body temperature in

respect to the prevailing environmental temperature. Very strangely it is seen that there appears a regular decline in body temperature in all animals that hybernate.

How and why this should happen can hardly be satisfactorily explained. We are left with the assumption that under the circumstances, environmental cold causes the animal's brain to bring about certain changes in its normal functioning. Hybernation conducts a slowing down of the animals entire metabolic system. It, in addition, furnishes a temporary state of rest to the organism bestowing it with a feeling of freshness and well-being once it snaps out of its drowsiness. In accompaniment to this there is the sunlight factor which is also seen playing its own active part in influencing hybernation in animals. Varying quantas of sun's radiation are equally responsible for alterations in the control and functioning of an animal's responses in its day to day activity.

However, speaking of hybernation as a whole, we understand the way it delays the process of growth or what may be termed the continuous change in an animal's body. In so doing all these factors mentioned above, indirectly help to appreciably spread out an otherwise limited existence of an animal that hybernates. Though hybernation is induced by increasing cold and lack of radiation from the sun, it is taken advantage of by a few capable of practising it and into whom it has by way of natural selection been hammered in since aeons.

Conversely it is observed that higher levels of ambient temperature are generally responsible for a reduction in life expectancy of most animals In order to combat the ill effects of high temperatures and larger doses of radiation by the sun, indulgent nature has furnished its unfortunate creatures with ingenious forms of compensatory devices. Sweat glands have been provided and the more profusely an animal sweats the cooler it remains because of the process of forced evaporation to which it is thereby submitted. Less lucky animals not endowed with such helpful facility, and those that do not possess sweat glands, are subject to a certain amount of drooling. This form of display is very much indicated in the frothing that takes place in the mouth of dogs. Panting is an additional assistance that helps quickly to evaporate from the animals mouth muzzle, chin and in some extreme cases right up to the forehead saliva that has because of drooling been spread over the area, and thereby rendering a cooling influence due, once again to forced evaporation, and a certain form of refrigeration, to these vital areas.

A hint of this extraordinary helpful mechanism is also present among homosapiens who in addition to having sweat glands have been provided with, and this refers to those who live in the tropics, dark pigmented skins that help absorb more warmth from the sun merely to induce perspiration for lowering body temperatures in respect of prevailing high temperatures.

Returning to the subject of longevity in any species, we find it to be the outcome of an equation that approves the extension of life span on the one hand and, a decline with age of the individuals subscription to posterity on the other. Finally we arrive at the mature conclusion that there are four main environmental components that to a great degree are responsible for altering life spans in animals. Looking at them we see that they are placed in the following order of precedence. (1) Death by accident or premature death. (2) The rise and fall in ambient temperature which is found to be responsible for increasing or decreasing any animals survival rate. (3) Amounts of food intake. In cases where food intake is higher than necessary, a much shorter life span is in evidence. More food it is seen, accelerates the metabolic function, and to some extent the rate of growth in the animals. Nutritious diet taken in quantities that slows the growth rate in any animal, but one which does not in any way detract from the animals health, is found to promote longevity.

(4) The controller of all animal functions such as growth rate, hybernation, metabolism, and biological urge, is situated in the brain. Ultimately the most decisive factor that emerges from investigations of countless case histories of various birds and animals, confirms the view that the larger the animals brain size in proportion to its body size the longer its life expectancy. This supposition does not include all cold-blooded animals however.

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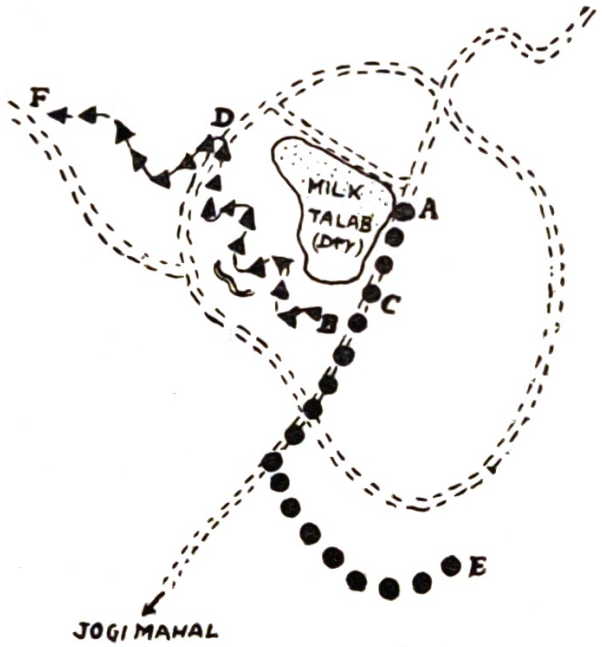
NATIONAL PARK, RANTHAMBHORE

Map showing Different Locations and Movement Routes.



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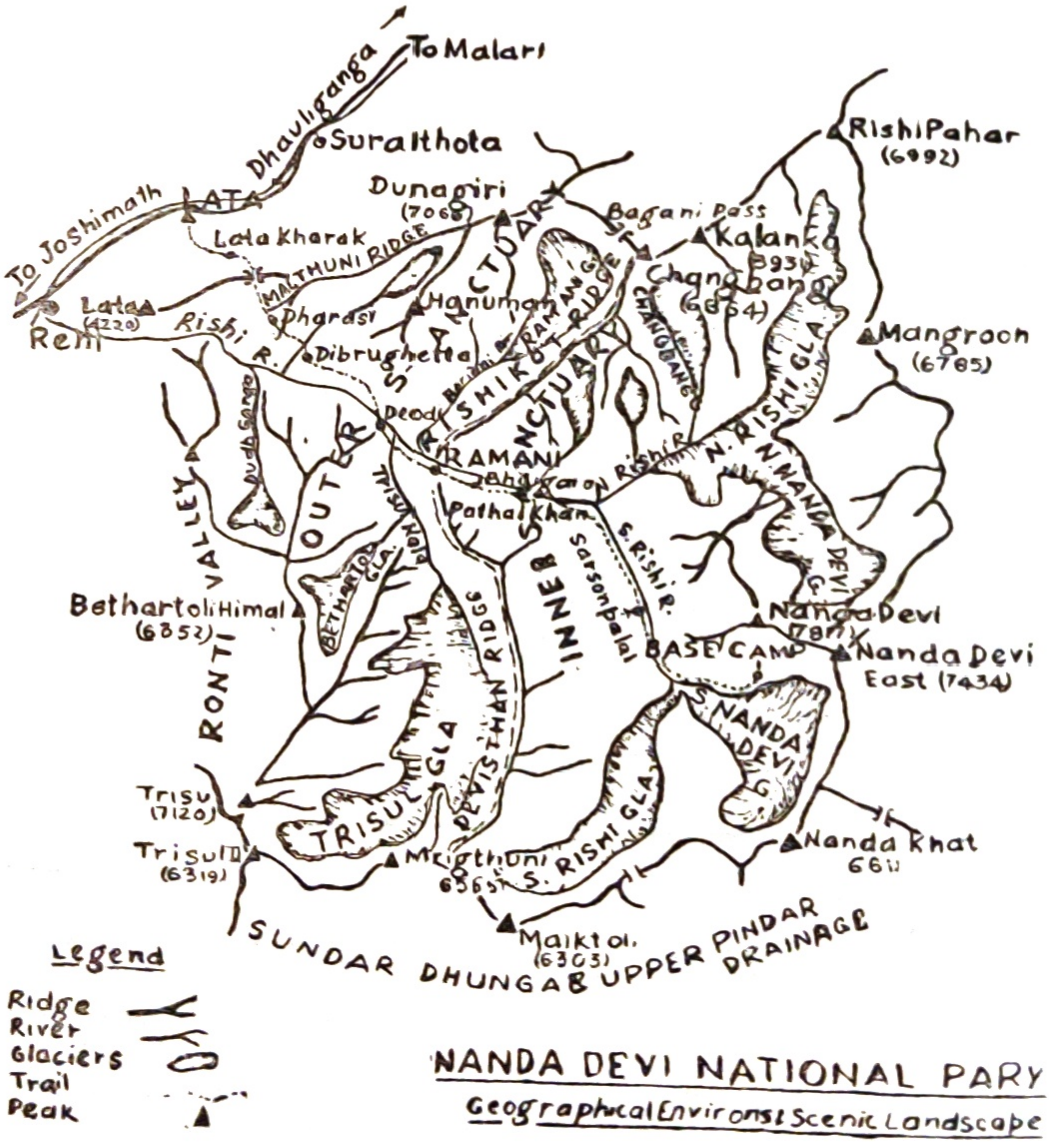
1. Fair Wheather Road
2. Movement rout of Tigeress in first experiment.
3. Movement rout of Tigeress in Secend experiment.
4. **A.B.** Point Where Tigeress and Tigeress with Cub were first seen.
5. **C.D.** Point Where Cubs and Tigeress Were Obstructed.
6. **E.F.** Point of reunion of family.

(See Article on Page 17)



NANDA DEVI NATIONAL PARK

Geographical Environs: Scenic Landscape

Nanda Devi—India's Highest Himalayan National Park: The Problem of Resource Use and Conservation

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With the advancement of civilization and speedy increase in human population, the bounties of nature all over the world are retreating, which has resulted in various ecological disasters apart from extinction of many plant and animal species.

However, Garhwal Himalaya, the land of mysteries and myths, with its great altitudinal and scenic contrasts, still can boast of some of the areas of primeval wilderness. Unfortunately, now man has started encroachment into these areas by way of deforestation and other consequent activities. The unplanned action programmes are leading to a further decay. The problem of protection of these areas add the wildlife residing in them has further become conspicuous when all these areas are gradually being opened for tourism. Nevertheless, as many as four National Parks and two sanctuaries have already been established in the area, to meet the conservation objectives but none of them is able to meet even the basic park concept, except the Corbett National Park in the piedment Himalaya.

The present article is an attempt towards the ecological study of Nanda Devi National Park and the impact of increasing human intrusion on the Park ecosystem. The author has also come forward with certain recommendations regarding the planning, organisational set-up and law enforcement that may considerably help the park planners.

The Study Area

This high altitude National Park is situated on the south-eastern part of Garhwal Himalaya between 30° 16′ N and 30° 32′ N to 79° 99′ E and 80° 02′ E, enclosing almost 799 sq km of superlative mountain scenery. The whole of the Nanda Devi basin or the 'Park Area' is encircled by a vast ring of lofty mountains* having an average height of about 6000; and thus giving it an appearance of natural fortress. Administratively, the area comes under

*Some of the important peaks encircling the National Park are: Dunagiri (7066 M), Changbang, 6864) Kalnka (6931) Rishi Pahar (6992), Mangraon (6765), Nanda Khat (6611), Maiktoli (6303), Mrigthuni (6565), Trisul-I (7120), Trisul-II (6319), and the Bethartoli Himal (6352), while the Nanda Devi-E (7434), Nanda Devi Main (7317), Devisthan-I (6529 and Devisthan II (6678) are the important mountains inside the park.

the Badrinath Forest Division of Chamoli district. On its southern and eastern sides, the park meets the boundaries of Almora and Pithoragarh districts of Kumaon Region respectively.

Approach

Lata, a typical 'TOLCHA' village, situated near the left bank of the Dhauli river, at a distance of 26 km from Joshimath (see map), serves as the best entry point for the Park (see map). The 62 km trek beyond this last habitation goes via-Bhelta, Lata Kharak, Dharasi, Dibrugaira (Dibrughetta), Deodi, Ramni, Bhujgarh and Pathalkhan to ultimately reach the sanctuary camp (Sarson Patal). A further 12 km trek leads to base camp, which is situated at the bottom of Nanda Devi on the South Nanda glacier. Besides Lata, Reni and Suraithota villages* are the other possible entry points. These treks, ultimately meet with the Lata-trek at Dibrugaira and Lata Kharak respectively. The whole trek is rather a wilderness trail where the shelter is possible under tents or sometimes in natural caves only. Rope is essential between Ramni and Pathalkhan. Again the last 11 km on way to base camp, is an uphill task. The Rishi glacier comes as a blockade and it has to be crossed with courage and skill.

Topography

The entire Park is a vast glacial basin and consists of many snow laden lofty peaks; large and small glaciers, glacial torrents, water falls, alpine meadows, hillocks, colourful boulders, morains, steep gorges and overhanging cliffs, besides the thick forest down the valley. Access to the park has become difficult due to the closed mountain system**. The basin is intersected by a series of ridges with a north-south trend. Most important among these is the Devisthan-Rishikot ridge which divides the Park into two parts i.e., the outer and inner parts, popularly called as the outer and inner sanctuaries respectively (see map). The inner sanctuary is further divided by Nanda Devi Mountain into two parts each supported by a vast glacier system. The northern system is comparatively broader and at a low level and includes three large glaciers i.e., the Nanda Devi North, the Rishi North, and the Changbang. The southern system however, is more active (Khacher 1979) and includes only two glaciers i.e., the Nanda Devi North and the Rishi North. Two streams, the North Rishi and South Rishi come out of their respective glaciers to meet below Pathalkhan.

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*Reni and Suraithota, both villages are situated on the same Joshimath Malari road at a distance of 24 and 33 km from Joshimath.

**The only route feasible to enter the Inner Sanctuary is through the steep narrow gorge of Rishi, lately a route via Trisul base has also been discovered. Longstaff Col. and the Sunderhunga Col. are the other two passes to enter the Park but are approachable only by an expert mountaineer.

Beyond this confluence the Rishi river flows through the stupendous upper gorge up to Ramni where it receives the tumultous Ramni stream. A little further, the Trisul torrent, coming out of the Trisul and Bethertoli glaciers join it. After Ramni the Rishiganga flows between thick forest and after receiving many smaller streams and waterfalls it ultimately comes out of the Park at Reni to join the Dhauli river.

The outer Sanctuary is also divided by the prominent Bethartoli-Malthuni ridge between Dibrugaira and Dharasi. Both these ridges form magnificent cliffs terminating into the Rishi gorge. Trisul, Ramni and the Bethartoli glaciers are the three prominent glaciers of the outer sanctuary.

Climate

On account of its closed system the Park enjoys a unique climate of its own. The inner sanctuary witnesses comparatively drier climate and low annual precipitation as the monsoon winds are kept away by the high ridges. The snow line inside the sanctuary is at a lower level and thick on the southern side than its northern counterparts. Mist and trails of low clouds sweeping over the meadows is a characteristic feature of the inner sanctuary.

The lower valleys in the outer sanctuary receive full blast of S.W. monsoon due to the inflow of rain bearing winds up the Rishi gorge. Monsoon generally starts by the third week of June. Snowfall may occur as late as mid June and may start as early as the third week of October. Summers are very short, coming first to lower valleys. The higher parts experience their summers in August. The characteristic Autumn phenomenon is visible in the outer sanctuary after the third week of September. One of the most characteristic phenomenon of the park is that the Nanda Devi Mountain, unlike other higher peaks, witnesses very little cloud formation in the afternoons.

The Flora

The distinctive climate enjoyed by the Park has of course created a distinctive flora which is yet to be properly explored. Though superficially the floristic pattern resembles any other inner Himalayan valley but up to now little basic information regarding the floristic pattern is available. Forest form very little percentage of the flora of the Park, which is mostly confined to Rishi gorge or some allied valleys. The dominant conifer is the Himalayan fir (*Abies pindrow*). Deodar (*Cedrus deodara*) is present in fine stands near Lata, but is absent inside the sanctuary. Spruce (*Picea morinda*) is significantly absent all along the trail. Himalayan fir has an admixture of Rhododendron (*Rhododendron arboratum*) and both the pink and white varieties of wild rose (*Rosa* spp.). Between Dubrughetta and Reni there is a fine belt of Bhoj forest. A very distinctive feature of this forest is the trailing lichen, festooning the trees, and the understorey of dwarf Rhododendron (*Rhododendron companulatum*). Broadly the Park can be divided into following ecological regions:

Mixed Temperate and Tropical Forests: Grows along the Rishi valley from Reni to Dibrughetta. Blue pine, maple, Akhrot, deodar and the like, near the confluence of Rishi and Dhauli, to fine stand of Himalaya fir at Deodi, and thereafter the belt of Bhoj forest up to Ramni.

Temperate Scrub: Continues above tree line to as high as 14000', The vegetation consists of dwarf Rhododendron, Cottonoeaster, Berberis and Juniper. Strikingly the warm southern aspect has extensive growth of Juniper.

Alpine Pastureland: Varying in luxuriance from the lush and succulent flower rich species of lower areas to the screaming thin soil growth higher up. The pastureland may end as high as 16000'.

The Fauna: Like the flora no definitive record of the fauna of the Park exists, as up to now no faunal survey has been carried out. However, the park abounds in a good deal of animals, particularly the Ungulates and the high altitude birds. Bharal or the blue sheep (*Pseudois nayar*) is the dominant and most conspicuous among the large mammals. According to a conservative survey based on the self observations and reports of porters and park visitors, Khachher (1979) has calculated about 500 bharal from the inner sanctuary alone, apart from 320 heads from other parts. Generally herds of Bharal can be observed grazing in the vicinity of the sanctuary camp. The animal seems to be more partial to gentle grassy slopes, however, its trek had also been reported as high as 5300 M, well above the snowline (Khachher 1979). Besides Sarsopatal, Trisul valley, Ramni basin and Dunagiri slopes are other favourite habitat of Bharal.

Tahr (*Hemitragus jemlahicus*) is another ungulate to be reported plentiful in the park but is hard to observe, as it frequents the most difficult terrain in the Rishi gorge—Khachher (1978), Dang (1973) and Sah (1976) have also confirmed its presence in large numbers.

Goral (*Nemorhaedus goral*) is another game animal to be found in the Park in good number. Khachhar (1978) and Dang (1973) have reported this smart creature from sanctuary camp area, and the villagers of Lata and Reni have confirmed its presence in their vicinity. This shows its distribution over a wide range.

Musk deer (*Moshus moschiferus*) is reported to exist in small number in the birch forest of Rishi gorge. Once abundantly found in the Park, this animal has become the victim of ruthless hunting for its prized musk pod.

Among the larger carnivores snow leopard (*Panthera uncia*) has been reported from the Park. It is very difficult to observe it due to its difficult habitat and swiftness. However Dang (1967) has claimed to see the animal from different parts of the park. The team of S

Stephens College (Khachher, 1978) has also witnessed its presence. The local villagers have reported its frequent attacks on their flocks, while they migrate to the pastures to graze their sheep and goats. The author has observed the droppings of the animal at various places inside the inner sanctuary. While Brown bear (*Ursus arctos*) has not been reported, the black bear (*Selenarctos thibetans*) is quite common in the area, below Dibrughetta.

Indian porcupine (*Hystrix indica*), the monkey (*Mucaca mulata*), and the langoor (*Presbytis entellus*) are common in the outer sanctuary near Lata and Reni villages. The Serow (*Capricornis sumatraensis*), the Samber (*Cervue unicolor*) and the Wild Pig (*Sus scrofa*) have also been witnessed by the villagers in their vicinity.

Park is very rich for the bird fauna specially the high altitude birds. Some of the important high altitude birds found in the Park are Monal pheasant (*Lophophorus impejenus*), Him. Snow cock (*Tetraogallus himalayensis*), Koklas pheasant (*Pucrasia macrolopha*), Chukor pheasant (*Alectoris graeca*), Snow partridge (*Lerva lerva*), Kalij pheasant (*Lophura leucomelana*), Cheer pheasant (*Catreus wallichii*), snow pigeon (*Columba leuconota*) and the Blue rock pigeon (*Columba libia*). Among others the Rufous turtle Dove (*Streptopelia orientalis*), Pied Crested Cuckoo (*Clamatos coromoniuts*), Him. Cuckoo (*Cuculus saturates*) Him. Pied Wood pecker (*Dendrocope himalayensis*), Alpine Swift (*Apus melba*), Nut Cracker (*Mucifraga caryoatactes*), Red Billed Chough (*Pyrrhocorax graculus*), Stracked Laughing thrush (*Garrulax lineatus*) and White Throated Laughing Thrush (*Garrulex albocularis*) are also common in different parts of the park.

Human Intrusion in the Park

For long the sacred and beautiful Nanda Devi Mountain and its mysterious inner basin remained a cherished dream of naturalists and mountaineers. The shepherds of Lata, Reni and a few neareby villages had been traditionally bringing their flocks across the Dharasi Col in the outer sanctuary but the inner sanctuary witnessed no human step as late as 1934. The first known attempt to enter the inner sanctuary was of W.M. Graham in 1883, followed by Dr. T.G. Longstaff (in 1907) and later by Hugh Rutledge in 1926, 1927 and 1932 but proved all in vain till 1934, when Eric Shipton and W.H. Tilman ultimately forged their way through the steep and narrow Rishi gorge. After the re-opening of the area for tourists, Nanda Devi once again began to attract the mountaineers and naturalists from all over the world, so much so that today it has become the biggest attraction of the mountaineers after the Mt. Everest. Apart from Nanda Devi the park houses more than a dozen high peaks. Among them are Changbang, Trisul, Devisthan and Dunagiri in which we have become more popular among the mountaineers. Now in addition to the mountaineers, naturalists and the tourists, the plant gatherers and the poachers have also become

active in the area and thus an era of unwise exploitation has begun, which may increase manifold, if not checked in time.

Impact of Human Intrusion

Deforestation: The expedionists according to availability use the firewood for cooking their food and since their porters don't have the proper clothes or tents, they frequently burn the fire throughout the nights to seek warmth and hence the Himalayan fir and Bhoj trees have fallen the worst victim. The impact can well be witnessed almost near every camping site along the route, particularly at Ramni, Deodi and Dibrughetta. Above the tree line, the poor Juniper met even wrose fate. At Pathalkhan, these Junipers have retreated not less than half a kilometre from the camping site.

Forest Fire: Another important factor leading to deforestation is the forest fire. Very often the tree trunks are burnt so as to get the firewood in coming trips. While leaving their camps, the park visitors leave the live embers or throw the ciggerette-ends carelessly in the vicinity. All these practices sometimes result in severe forest fires.

Soil Erosion: It is true that the mountains particularly the youthful Himalayan range, are more subjected to erosion, the well known causes being the more gravitational force on the steep slopes, action of rivers, glaciers, avalanches, and the extremes of temperature in addition to general aridity of the soil and harsh and dry climate. However, the flocks of graziers and load carrying sheep and goats have increased the process manifold*.

Disappearance of the Fauna and the Flora of the Park

Vulnerable Flora: Apart from its direct affect the deforestation poses a considerable impact on the successional process and climate. The impact of innumerable flocks grazing traditionally on the same area can well be determined on the vegetation. Again, the load carrying sheep which were at one time restricted to the outer sanctuary have began to reach the sanctuary camp, which is a more sensitive area. With the greater demand and higher prices of the plants of medicinal, incense and other values, large number of plant gatherers have also been active in the area. This unchecked irradication of the selective plants may result in total extermination of these plants from the area.

The Vunerable Fauna: Until the appearance of first man, the park witnessed rich faunal wealth, which has been confirmed by the early explorers of the area. Today the situation is totally changed and many animals are fighting the last ditch battle for their

*The number of sheep and goats brought for grazing to the traditional pasture of Dharasi, Lata and Dibrughetta etc. had reached to 4000 heads annually. In additional several hundred animals pass through, carrying the baggage of the expeditionists, hence the impact can well be determined.

existence in the area. Musk deer, largely massacered for the pod survives in very few numbers in the birch forests of Rishi gorge. The tahr and the bharal have also been largely persecuted for their flesh and pelt. Almost similar fate is witnessed by the Goral and many of the game birds. With the non-availability of the prey and human intervention in its habitat, the snow leopard, the only large carnivore in the inner sanctuary is almost at the verge of extinction. Of course one of the cause of the disappearance of the animals is that their habitat and activities have been restricted because of human intervention but then the main cause is hunting. Though after imposition of ban, the expeditionists have stopped their activities but the poachers have become more active. Now, when the easily accessible areas have been depleted they have become active on the secluded areas. The plant gatherer indirectly help them by pioneering new trails. The shepherds may also frequently use their licensed firearms against the game animals during their stay in the summer grazing grounds.

Cultural vendalism: Cultural vendalism is yet another-outcome of the intrusion of the 'out-siders' in the area. An iron sword that was worshipped by the local people as the guardian of Dharasi pass and two precious images from the famous temple of Nanda Devi at Lata have been stolen two years back. The villagers believe the mischief has been done on the instance of the foreign visitors. Once very innocent, these tribal people have developed such michieuous habits through the travel agents and the guides that now the expedition parties prefer to hire the Nepali porters, or they bring their own, from elsewhere. The purpose of this paper is not to discourage tourism or mountaineering activities in the area nor does the park concept restricts it. In fact control is needed in their promotion. No doubt, it has certain inverse impact on the cultural and biotic environment of the area, but then the impact can be minimised through wise management. To meet this objective certain recommendations are being cited here that may help the future planning.

Recommendations

1. A thorough survey of the flora and fauna type should be carried out and projects as well as individual research should be encouraged in this regard.

2. At least two assistant wildlife wardens with skilled staff should be appointed at Lata and Reni villages, and the entry to the park should be restricted from only those two points. Entry to the parties should be allowed alternately from these places, which will considerably minimise the disturbances along the trail.

3. An additional staff of trained and well equipped guides must be stationed at least at Dibrughetta, Deodi, Ramni, Pathalkhan and Sersopatal from mid May to last of September. It will not only discourage the poaching but will also check wanton destruction of the vegetation.

4. Entry fee should be fixed at least Rs. 50/- per member and no one should be allowed without proper equipments, particularly without appropriate clothing and the minimum needed fuel, otherwise the arrangements should be done by the wildlife warden's office on payment basis.

5. Load carrying flocks should not be allowed at any cost and provision of alternate winter grazing grounds should be done. The grazing flocks should not be allowed above a maximum number, fixed according to carrying capacity of the area.

6. The poaching should be discouraged by imposing heavy penalties to the extent of imprisonment. Arms should not be allowed inside the park even to the licensed graziers.

7. Local people should be initiated to take part in the various conservation programmes through films, photos, literature and by awards for their efforts.

8. Eco-development programmes should be extended to this and other far off regions.

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Observations on Cheetal at Guindy National Park, Madras

By

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Introduction

Guindy National Park (G.N.P.) measuring about 850 acres lies within the city of Madras. The adjoining Indian Institute of Technology (IIT) campus measuring 640 acres was once a part of the original Raj Bhavan compound (forest). Although there is a barbed wire fence between the two areas, there is almost free access to animals through the many breaks in the fencing.

The forests here are of the dry deciduous thorn type. The two main mammals available in both places are the Blackbuck (*Antilope cervicapra cervicapra*) and the Cheetal (*Axis axis*). They are free ranging, those in IIT being more habituated to the presence of man than those in G.N.P.

Census of Cheetal was taken from June 1981 to June 1982 at three month intervals in both areas with a view to study the movement pattern of Cheetal between the two habitats.

Methodology

Belt or strip-transact method was used, and all census was started around 0800 hrs. A pocket compass was utilised to maintain a straight line during transect, and to minimise disturbance to the animals, the census party was kept to the minimum—the investigator and a watcher of the Tamil Nadu Forest Department. On all occasions the stride measurement of the watcher was used to measure transect lengths.

The transact method used is a modification of that by Anderson and Pospahalla (1970) where an arbitrary distance right angled to the transact line limit sampling. In this case sampling was limited by the amount or distance of visibility reading, right and left at right angles to the line were taken and recorded. Only animals within this limit were recorded. Width of the sampled area is the average of visibility readings. The length of the transect is measured in steps and eonverted to metres.

$$N = \frac{A}{sa} \times n$$

Where A = Total area

sa = Sampled area

n = Number of sampled animals

An error or shortcoming in this is recognised. Where the distribution of animals is patchy or clumped (as in Black Buck who form territorial mosiacs) the count tends to be on the higher side, but when the animals are randomly or evenly dispersed, past experience shows that a fairly accurate figure may be expected (for instance in Cheetal).

Results

Table 1 shows little variation in the total population of both the habitats taken together, except for the month of December. This suggests that the two populations are ecologically one.

Table 1

Total Population/Density of IIT-GNP Cheetal

Date	G.N.P.	I.I.T.	Total Population	DensityAere
19.06.81	583	545	1128	.79
12.10.81	893	108	1011	.71
22.12.81	427	168	595	.42
31.03.82	827	421	1248	.88
22.06.82	756	515	1271	.89

Table 2

GNP Cheetal

Date	Population	Density/ Acre
19.06.81	583	.68
12.10.81	893	1.04
22.12.81	427	.5
31.03.82	827	.97
22.06.82	756	.87

Table 3

IIT Cheetal

Date	Population	Density/Acre
19.06.81	545	.96
12.10.81	108	.19
22.12.81	145	.22
31.03.82	421	.73
22.06.82	575	.91

The density of Cheetal at GNP in the month of October was very high (1.04/acre) while at the same time there was a drop at IIT (.19/acre) although the total population remained almost the same in both habitats. (1011 against 1128 for June). In the month of December there was a severe drop in the density of animals of the total population (.42/acre). This seems to indicate a movement of animals out of the two habitats. By March there was an increase in density of the total population (.88/acre). In June the density was same, as the animals had returned.

The density of Cheetal in GNP and IIT in June was as follows : ·68/acre and .96/acre but in October it had risen to 1.04/acre in GNP while a considerable drop took place in IIT—.19/acre. In December the density at GNP crashed to .5/acre while at I.I.Ti it remained about the same .23/acre. This indicates a movement of Cheetal out of IIT into GNP some time between June and October. Again, some time between October and December there was an exodus of Cheetal out of GNP into the neighbouring places around the National Park—IIT complex. By March the return trip had taken place, the density of GNP rising to .97/acre while there was a similar rise at IIT. By June the animals had spread out into the two habitats. This movement appears to be related to the rainfall of the area.

October/November is the rainest months of Madras (mean rainfall 267 and 308 mm respectively). By December the forage and cover availability would have increased all round. The pressure of increased population in GNP plus the availability of resources would have

induced the Cheetal to temporarily colonize the areas outside the Park. They return when the dry season approaches leaving behind a residual population (See map).

Since IIT is completely walled on its Eastern, Southern and Northern sides, the only outlet for these animals is through the breaks in the fences between GNP and IIT. Perhaps the Tamil Nadu Forest Department grass feeding program during summer may be an inducement for the initial exodus into GNP from IIT. Guindy National Park being more or less open on all sides, breaks in fences provide access to the neighbouring compounds.

Census figures of GNP of May 1976 by the Tamil Nadu Forest Department (total count method) was 1360 Cheetal and 740 Blackbuck for the then area of 302 hectares (Shingo Miura, 1981). Shingo Miura says that these densities are considerably higher than other populations (See Sharat Chander and Gadgil 1971). The present densities of GNP and IIT are probably more realistic. This has relevance to the wall along the perimeter of GNP, presently under construction. With IIT already walled totally on all sides, the new wall around GNP will confine some 1300 Cheetal, apart from Blackbuck and other animals within about 1500 acres (see map). The annual increment of Cheetal now appears to be around 12%. With the Tamil Nadu Forest Department grass feeding during the pinch periods, these animals are healthy, while dog predation has been controlled by the Department. The excess animals must therefore spill over to the adjoining vacant jungle areas. But if this immigration is curbed, even an increment of 12% must lead to problems in the years to come.

Acknowledgement

I wish to thank the Wildlife Warden, Madras, for permission and facilities for conducting census in Guindy National Park and to Mr. A. Selvam for help in the same.

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Trout Fishing in Kashmir

By

A.R.H. Bulu Imam

Kashmir must be the most beautiful place on earth. It is not by accident that it has been referred to as, "heaven upon earth", "the happy valley", or poetically, "an emerald set in pearls". A high-altitude saucer (6000'-16,000' a.s.l.) flanked to the north by the great Central Himalayan Range, and ramparted on the south by the formidable Pir Panjal Range (13,000'-16,000'), it was in olden times an oval lake eighteen miles wide and eighty miles long. Today, the river Jhelum and its tributaries meander through this lush green meadow land dappled with waterlogged fields and landscaped with slender elms and poplars, as countless other spring-fed and snow-fed streams cascade down the mountain walls through verdant valleys making the Vale of Kashmir a land-scape of waterways. The Valley is shaded with walnut, chinar, elm and poplar trees, and orchards of cherries and plums, peaches and apples, pears, pomegranates and mulberries. At altitudes of over 7000. 'are the margs bedecked with pines, and at over 10,000' lie the stony tracts where birch and juniper alone grow up to 12,000' which is the snow-line.

The similarities of many of the features of Kashmir with Scotland attracted the attention of the keen fishermen towards the end of the nineteenth century. They were Maharaja Amar Singh of Kashmir and that sporting Englishman, the Duke of Bedford. At the instance of the Maharaja a party af sportsmen, Mr. Frank Mitchell, Colonel Ward, Captain Unwin, Colonel Stuart Godfrey, and the then Resident, Sir Adelbert Talbot, approached the Duke. This great gentleman gave the Kashmir Durbar ten thousand trout ova from Scotland stocks, and Mr. Mitchell took on the responsibility of supervising their hatching in the Bagh-i-Dilawar Khan waters. All waters in Kashmir were in those days State-owned, and so naturally the trout became the monopoly of the State. After initial disappointments in the hatching of the trout ova, a fresh attempt was made in the setting up of a hatchery at Harawan, just beyond the Shalimar Gardens. Today the hatchery is still active, and a source of supply to the trout waters of Kashmir.

It is interesting to note that after the first trout spawn were released into the Kashmir streams, initially it seemed they had died out, but happily it was later discovered that the fish had begun avidly multiylping in these gin-clear and frothy snow-fed waters and were fully adapted to their new conditions.

Uptil 1906 only the Bringhi, Lidder, and Arau, Acchabal, Erin and Madumati streams were stocked. Later, other streams were stocked, and now a vast choice of trout waters are

offered to the angler. As far back as 1906 a 12½ pound trout was caught and the present record is 14 pounds. Such a specimen would be about 30 "in length, and have a girth of around 18". The two main types of trout available are in the Brown Trout, which as its name implies is a rather common-looking fish, while the Rainbow Trout is a spectacular, speckled, silver, red and blue beauty. A light coloured variety known as the Snow Trout is also some times found. All trouts are tremendous fighters once hooked and can give the most expert fisherman anxious moments. The trout is a great sport fish, but often manages to get off the hook if given a loose line.

Fishing on each river or stream has its characteristic features, but these can be divided into set types. For instance, the larger rivers such as the Singh, Lidder, and Kishenganga are furious, foaming torrents in the afternoon during the summer months (May, June, July). In the calm pools, behind smooth boulders, where a gently sweeping current flows, is the place where the big trout prefer to lie. The young ones sport along the frothing steps of waterfalls and cataracts. Spinning is allowed in these rivers. A spoon is merely a spoon-shaped piece of shining metal barbed with hooks, sometimes coloured, resembling a minnow. It is attached to a trace or lead and then to the line itself by a pivoting device which after casting, on being retrieved through the current causes it to spin and flash, enticing trout to strike. However, far more exciting is fishing with the fly. This can be wet or dry. A wet fly is merely a few colourful feathers tied onto a hook to resemble a seasonal insect. Fly-stying is an art. Generally there are two flies on a line. The bigger one being on a slightly longer trace or lead. A weighted lead piece facilitates casting. When drawn through the current they resemble a pair of insects chasing each other. Left to drift, they resemble dead insects. The fly is cast in likely places as one walks downstream along the riverbank, or wades in the water, and one keeps up a continuous process of casting and retrieving. Trout streams are best in April, before any snow-fed water clouds the current, and later, in August and September before the season closes. At such times the fish can see the flies and spoons more easily, and consequently this means more strikes.

Many rivers have side streams which also afford fine fishing, such as I shall presently describe. The second type of water includes streams such as the Bringhi, Erin, Madumati, Kulgam and Ferozepur nullas. Here flies are the rule, and wet fly fishing is good throughout the season.

The third type of water includes small spring-fed streams such as Verinag, Kokernag, Kotsu, Acchabal, Panzeth; Isthal etc. which are good for dry and wet fly fishing throughout the season.

All the trout waters in Kashmir have been divided systematically into stretches called "beats" for which licences can be obtained from the State's Fisheries Department, located

at the Tourist Reception Centre, Srinagar, at very nominal charges There is a heavy demand for licences, especially on choice "beats", and so the angler wishing to fish on a good stretch of trout water should reserve ahead. For those who may not be acquainted with the sport I will briefly describe the tackle required. A light fishing rod of either cane or fibreglass of about eight feet in length, and three inch wheel filled with either a Kapard Kingfisher, bubble or similar type of line having and adequate casting weight, a few nylon leaders or traces, lead weights, and a small selection of spoons and flys will complete the requirements. All these items can be hired at the premises of the T,R.C., or purchased at one of the well-stocked anglers' stores in Srinagar.

Flys are simple in principle, their selection being more important than their type, depending on the season. However, the making or tying of flys as it is called, is a delicate art, for even in fast-flowing and frothy water a trout can tell the differnce! The selection of flys by the angler depends on the season, the weather, and the water being fished, and a good trout fisherman selects his flys with the care a Bridgeplayer takes in making calls. Flys go by such exotic names as Peacock. March Brown, Watson's Fancy, Coachman, Jack Scot, Invicta, Butcher, Jinger, Quill, and the list is endless.

This summer, led with a fisherman's fancy, and having transported our fishing tackle two thousand miles, my elder son Justin and I were all set to fish the trout waters of the Valley. For memories' sake I chose the Lidder Valley area for our first outing, but unfortunately the beats on the Lidder River which were really good were already booked, so we settled on the Tricker, being an offshoot of the main stream. Tricker offers some of the finest fly fishing in Kashmir, and is situated alongside the Lidder in this picturesque valley.

Driving east out of Srinagar, through the scented saffron fields of Pampur, past orchards of mulberry, almond and cherry, along stately avenues of poplars, the ranges of the Pir Panjal among which I have hunted the elusive Markhor ran along our south, while to the north the main wall of the Himalayas opened in valley after valley. We left the National Highway at Khanabal, proceeding through the picturesque town of Anantnag closeby to the famed Acchabal proudest of all Moghul Gardens, and moved up the Lidder Valley on the left bank of the Lidder River, heading toward Pahalgam, the village of shepherds, nestled in the folds of those mighty mountains which shelter Amarnath and the Kolahoi Glacier closeby. Not far from Pahalgam the Sheshnag and the Arau streams have joined to form the Lidder River which is one of the finest trout waters of the world, set amidst a fantastic scenic backdrop unparalleled anywhere. Behind lies the vast and majestic Kolahol snowfield and the rugged slopes of Amarnath in the northern ice wastes, while before us lies the snowclad rampart of the Pir panjals covered in snow, mountain and sky both powder-blue with aerial distance, while below, between, in a maze of elms drowses the Vale of Kashmir.

As we drove past Martand, famous for its sun temple, and began climbing towards the pines we drew abreast of the offshoot waters of the Lidder near Jumoo village. At Akkar, where there is a trout farm, I collected a *shikari*, and in the shady, sleepy little village mentioned I got another old *shikari*, and before long the beat Watcher, or guard appeared, and I showed him the licence for checking. Gulab Nawi, one of the two *shikari* or Gillies as they're sometimes called, was a keen fisherman himself.

Not far from Jumoo, at most a quarter of a mile, crossing through rice paddies and smooth boulders, we came up to Tricker No. 3 Beat, which was one of the favourite trout waters of Maharaja Hari Singh, very likely as much for the sport provided as for its unique scenic charms. Unpacking the tackle boxes we set up our fishing rods, and soon I was casting up, and then down this one-mile long beat in the fast, frothy waters which I admit were a bit cloudy due to the thawing ice. Before success came two beautiful trout took advantage of a slack line, and as Gulab Nawi went to catch them de-hooked themselves. Trout as I have said are great fighters, and it is a fine sight when they splash out of the water fighting the line. However, soon I had pulled out two brown trout weighting about two and a half pounds each. I waded down the river, up to my knees in cold water, the going on the smooth stones never very easy. At the deep pools I had to get back to the bank again. The highlight of the day was a three pound rainbow trout. Fighting one fish I lost a fly to it as it broke the line. Looking back, a fishing basket would have helped. I was using mainly a Double Coachman and Peacock fly that day. My Gillies were keen on using live worms, but a word of caution here. This is both illegal and unsporting, and the beginner had best to avoid this favourite advice of the *shikaris* he gets at trout waters in Kashmir.

The trout is the most delectable of all fish to grace a dining table, and it was not without some ceremony and great relish that my family and I ate them for breakfast the next morning. Indicentally, ten years before on that very houseboat dinner table my wife and I and an American guest hunter Bob Phipps had eaten ten roasted snipe each being our bag of the day ! Kashmir always has a way of being nostalgic once you have visited it.

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NATURE'S HAVENS OF HOPE
National Parks of the Indomalayan Realm

By

M.K. Ranjitsinh

The illiterate but ingenius Indian ruler, Maharaja Ranjitsingh of the Punjab, when shown a map of India depicting the territories of the incipient British Indian empire in red, remarked that all would turn red. History proved him right, for the whole subcontinent came under British hegemony. Perhaps the most interesting maps of modern times are satellite shots showing the environmental status of planet earth and the variations in forest cover. The deforested and inhabited areas show up in various shades of red. At the rate at which the forests of the Indomalayan realm are vanishing, it requires no 'pundit' to predict that the whole landmass will soon show red on those photographs.

1. The Only Climax Forest in the Future ?

The population of Asia, excluding the USSR, increased from approximately 1887 million in 1950 to about 3182 million in 1975, and is expected to rise to 5312 million by A.D. 2000 (Ranjitsingh 1979). In Nepal one hectare of land must now support 9 people. The present standing wood volume in cubic metres per person in Asia is 15, as against the world average of 75. According to the Food and Agriculture Organization of the United Nation (FAO), approximately five million hectares of forests are "lost" annually in Asia (Tiger Paper, 1978). Some 8 million hectares are burnt and temporarily cultivated every year, by approximately 200 million shifting cultivators affecting about 300 million hectares of forest. It is estimated that almost 30 per cent of the officially designated forest areas of some of the south and southeast Asian countries are put to such usage (Ranjitsinh 1979). According to the National Economic and Social Development Board (NESDB) of Thailand, the total area of forests in that country has been reduced from 58.3 per cent in 1952 to 39 per cent in 1973 and a mere 33 per cent in 1978. Some experts predict that at the current rate of reduction all forests would have gone by 1987, while others disagree to grant a few years more. The National Environment Protection Council (NEPC) of the Philippines reports that one third of the total land area of that country is now susceptible to erosion. In Indonesia 12 million people are engaged in shifting cultivation affecting a total forest area of 37 million hectares. The Malaysian National Forestry Council warns that at the present rate of logging Malaysia, which is losing forests at the rate of 275,000 hectares a year, would

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have lost its forests by 1990. At the current rate of destruction Nepal is expected to lose its forests by the end of the century. Pakistan has today only 3.5 per cent of its territory under forest cover (Ranjitsinh 1979). In India, though the official figures record about 23 per cent of the land area as forest land, barely 2 percent is under forest cover approaching its natural richness (Gadgil 1982). In countries like Sri Lanka, Malaysia and India large forests areas have been given to Forest Corporations for conversion into man-made forests.

Yet amongst all this gathering gloom and grave prognostications a most heartening phenomenon emerges. Aerial photographs of the Petchabun Range in Thailand shows the National Parks and the protected areas – Nam Nao, Phu Kradeung and the rest—still intact, while dessication is fast overtaking the rest of the forests. Southwards, a dark patch emerges in sharp contrast with the clear-felled areas all around. That dark patch is the Khao Yai National Park. The pristine forests of the Periyar Sanctuary in Kerala still survive, surrounded though they are by some of the most densely habited areas in the world. Yet a little northwards, the magnificent forests of the Cardamom Hills, though a Reserved Forest but not a part of the protected areas system of the country, have all but gone. The transformation that greets one upon entry into isolated 'pocket' paradises like Ranthambhor in India and Ujdung Kulon in Indonesia is almost unbelievable. The scenario and the richness inside the precincts bear no resemblance to the stark world of despoilation immediately outside.

It is in this context that the significance of the protected areas system and particularly of the national parks of the Indomalayan realm, has to be assessed. The holocaust which has engulfed the forests and other wildlife habitats have not by and large seriously affected these areas—not as yet. It is only in these tracts that not only the magnificent fauna and flora of this region, but nature as such, has hope for long-term survival. In many countries these protected areas may well be the only places where natural climax forests will survive in the twenty-first century. The implications and ramifications of such a surmise are only too obvious.

The matter assumes even greater significance when one considers two aspects so pertinent to this realm. Firstly, the incredible richness and diversity of the faunal and floral wealth of the region and the niche it therefore occupies in the world heritage; and secondly, the endemism and the threat of extinction that faces so many life forms.

2. Bounty of Nature

The tropical moist forests of southeast Asia are amongst the oldest forest types in the world, being at least 30 million year old (Richards 1964). Unit for unit they are also the richest biotic region in the world. Java has 4500 plant species, Sumatra 6000, Sulawesi 5000

to 6000, Philippines 7000, Peninsular Malayasia 8000 and Borneo 9000 to 10000. The State of Brunei with an area of 5000 sq. km has 2000 tree species whilst Holland with an area 7 times larger in size possesses only 30 (Myers 1979). Indonesia's forests are estimated to contain about 25,000 species of plants, 500 species of mammals, 1500 species of birds and perhaps a million species of vertebrates and invertebrates (Sumardja 1980).

The Sunda Shelf alone boasts of 732 species of birds, as against a tally of 398 for the whole of Europe West of the USSR, an area 4 times as large (Medway 1978). The Oriental Zoogeographical region, though the smallest in the world, has the largest number of the non-aquatic large mammalian families of the world. Twentyone out of the 36 species of wild cats of the world, 5 out of the 8 bear species, one of the two elephant species, 3 of the rhinoceros species, 18 of the 41 deer species and 7 of the sub family *Bovinae* comprising of wild buffaloes and wild oxen, are found in this faunal region.

3. Endemism and the Threat of Extinction

Next to the oceanic islands, south Asia has amongst the greatest degree of endemism in the world. Almost half of the bird species of the Malay peninsula and more than half the mammalian species of the Philippines are endemic (Myers 1979). The Abbot's booby, *Sula abbotti*, is now found only on Christmas Island south of Java and the Narcondam hornbill, *Aceros narcondami*, only on the Narcondam Island of the Andamans. The unique island of Palawan is the only home of the Palawan peacock pheasant, *Polyplectron emphanum*, and the white-eyed river martin, *Pseudochelidon sirintarae*, has so far been recorded only on Thailand's largest freshwater lake. Bueng Buraphat, which is also one of the last habitats of the Siamese crocodile, *Crocodilus siamensis*. The red-faced malkoha, *Phaenicophaeus pyrrhocephalus*, endemic only to Sri Lanka, is now perhaps confined only to the Singharajah forest. The Rothschild's starling, *Leucopsar rothschildi*, in recent times at least was localised only in what is now the Bali Barat conservation area on the island of Bali, Indonesia. The Cebu black shama, *Copsychus niger cebuensis*, is confined only to the Cebu island in the Philippines and even there its range is extremely limited.

The Mentawai islands south of Sumatra hold four endemic species of primates, two of which have split into separate subspecies; an endemic species of squirrel, *Callosciurus mentawi*, and 10 other endemic subspecies of mammals (Mc Neely 1980). The endangered Indus dolphin or susu *Platanista indi*, is confined only to the lower Indus water system.

The Kuhl's deer, *Cervus porcinus kuhli*, occurs only on the small Indonesian Island of Bawean and the Calamian deer, *Cervus porcinus calamianensis*, on the small Calamian group of islands in the Philippines. The dwarf anoa buffalo, *Bubalus depressicornis*, is found

only on Sulawesi and the tamaraw, *Bubalus mindorensis*, on Mindoro alone, also in Indonesia and the Philippines respectively. The unique babirusa pig, *Babyrousa babyrussa*. with tushes that subscribe a circle over its head to earn it the local name of pig-deer (babi-rusa), occurs only on Sulawesi and the adjacent Togia island. The Nilgiri thar, *Hemitragus hylocrius*, is found only in the southern parts of the Western Ghats and the Indian wild ass, *Eqvus hemionus khur*, only in the Little Rann of Kutch, both in India. The now extinct Schomburgk's deer, *Cervus duvauceli schomburgki*, which next to the moose carried a pair of antlers with the largest number of tines of any living species, was confined in historic times at least only to the flood plain of the Chao Phya river in Thailand. The gaint catfish or plabuk, *Pangasionodon gigas*, the largest exclusively freshwater fish in the world, inhabits only the waters of the Mekong River.

The plant *Hubbardia heptaneuron*, now believed to be extinct, was recorded only from the spray zone of the Jog Falls of the Sharavati River in Karnataka, India. The unique orchid *Dendrobium paucciflorum* has been recorded in only two sites in Sikkim and West Bengal in India. The only known population of the lenteri palm, *Areca concinna*, numbering about a 1000 specimens, occurs only in a swamp 2 to 4 hectares in extent in the Kalutara district in Sri Lanka and is threatened with a change in the drainage pattern.

The only known wild population of the rattan *Ceratolobus glaucescens*, numbering not more than 30 plants, is now confined to a locality near Pelabuanratu on the south coast of west Java, and the only wild population of the palm *Maxburretia rupicola* is confined to the tops of 3 limestone hills—Batu caves Hill, Bukit Takun and Bukit Anark Takun, all wtihin 40 km of Kuala Lumpur in Malayasia (IUCN Plant Red Data Book, 1978).

The problem is further compounded by the fact that faunal species are not always adaptive to change. Harrison (1968) found 76 species of mammals in 150 sq. miles of lowland forests in west Malaysia, as compared with only 11 indigenous species in areas converted to rubber and oil palm cultivation in the neighbouring tracts. Only 5 per cent of the tropical birds could adjust to a change from a forest to a non-forest habitat (McClore and Osman, 1968). Even a large-sized specialised animal like the Schomburgk's deer, which could not adopt to a change from its preferred swampy habitat, became extinct in the Chao Phya flood plains of Thailand.

Add to all this localisation the tremendous demographic pressure which has been increasingly exerted for centuries and it is not surprising to find a long list of candidates for extinction. Of the thousand species and sub-species of vertebrates in the world that are deemed to be endangered, more than a quarter exist in Asia. The Red Data Book of the IUCN lists sixty-one species and sub-species of mammals alone that are threatened in South

Asia. Eighteen out of the 29 forms of threatened deer listed by the IUCN occur here.

The world population of the Javan rhinoceros *Rhinoceros sondaicus*, numbering altogether about 50, seek refuge in the Udjunk Kulon National Park in Indonesia, and the world population of the Asiatic lion, *Panthera leo persica*, numbering less than 200, in the Gir National Park in western India. The only safe haven for the Kashmir stag or hungul, *Sevrus elaphus hanglu*, numbering not more than 400 all told, is the Dachigam Sanctuary in Kashmir. But the pride of place amongst the mammalian subspecies threatened with extinction in the wild in the world, must surely go to the Manipur brow-antlered deer, *Servus eldi eldi*, confined only to less than a 20 sq. km habitat in the Keibul Lamjao National Park in Manipur, India. Down to 14 animals in 1975, a population of 30 specimens was reported in 1979.

The purpose of this lengthy prelude above is to stress only one factor which I feel should be the central theme for the national park of the Indomalayan realm, and which is, that the assured long-term future safety of this wondrous floral and faunal wealth, much of it so localised and endangered, lies only in the protected areas of the nations of south Asia. From this standpoint, therefore, the parks of this region are perhaps the most important in the world. To safeguard this world heritage, the parks need to be established to protect diverse and unique habitats, biomes and ecosystems, relict and threatened populations of living organisms both terrestrial and aquatic, and to achieve this the protected areas must be of adequate size, should be inter-linked as far as possible and above all, appropriately protected and managed. At the same time, there is an urgent need to involve the people, for even national parks and sanctuaries can remain safe in the long run only with popular support.

4. Factors which Impede the Establishment and Effective Management of Protected Areas

Predictably, the main obstructions and problems stem from demographic pressures and the need to develop the economics of the nations of the region. The word "Conservation" is still synonymous in some minds with the word "protection". Even in the minds of the educated and of the decision-makers, protected areas are still identified as an elitist concept as non-utilized tracts, and hence a waste of resources. The peoples whose practices and privileges of exploitation, legal or otherwise, that have been curtailed or stopped due to the establishment of protected areas have, understandably, found it the most difficult to acquiesce. Grazing of livestock and collection of firewood and other forest produce with the concommitant disturbance and incidence of fire, have been the greatest banes of the protected areas of the Indian snbcontinent. This exploitation and the existence of human populations and cultivation that is permitted in most wildlife sanctuaries, is the main reason, together with the revenue from legal timber extraction, that has prevented the State

Governments of the Indian Union from converting more sanctuaries into national parks than they have done so far.

Many of the protected areas, particularly in the Indian subcontinent, have been a legacy from the colonial past. They were originally hunting reserves and had been established mainly for the number of sporting animals and birds they held. The early approach to management, therefore, was species protection oriented, which is now gradually changing to habitat conservation methods. However, the ecosystem approach which takes into account representative and unique ecosystems with a view to include them in the protected areas system, has not quite been launched. Many ecosystems, particularly grasslands, coastal and marine areas, remain very inadequately represented in the national protected areas systems.

Threatened species like the Siberian cranes, *Grus leucogeranus* and the hangul are not safe once their seasonal movements take them outside the precincts of their winter haunts—the Bharatpur National Park and the Dachigam Sanctuary, respectively. In many instances the major portions of relict populations of threatened species like the lion tailed macaque, *Macaca silenus*, the pygmy hog, *Sus salvanius*, the Javan warty hog, *Sus V. verrucocus*, the false gavial, *Tomistoma schlegeli*, the white-winged wood duck, *Sairina scutulata*, and Cabot's tragopan pheasant, *Tragopan caboti*, to name just a few, still live outside existing protected areas.

Many of the protected areas are too small and too isolated with the destruction of suitable habitats around 41 sanctuaries of Sri Lanka have areas less than 20 sq. miles in extent each, many of them being less than 1 sq. mile and that too not clearly demarcated. The breakdown of corridors and the resultant isolation had have the most adverse impact on large mammals like the elephant, *Elephas maximus*, causing destruction of the habitat in the confined areas by the pachyderms themselves, irracibility amongst the animals, and depredations and damage to human property outside the protected area precincts. Where the forest conopy has been removed, as in the parks of India, Malaysia, Sri Lanka and Thailand, exotic weeds like *Lanrana camapa*, *Eudatorium odoratum* and *Strobilanthus collusus* are taking over to the detriment of the grasslands and forest understorey. In the Manas Tiger Reserve and the Jaldapara Sanctuary in eastern India, both important for the populations of the Indian rhinoceros, *Roinoceros unicornis*, that they hold, the exotic *Mikania scandens*, is choking the trees and the grasslands in the open patches. Biological control of these weeds has not begun, and it is too dangerous to experiment with herbicides.

Applied research which could be utilized for practical managerial purposes in protected areas, is still in a nascent stage in the region. An impetus to this, including establishment of a few field research stations, is of primary importance.

Lack of finances and the consequent lack of protective personnel, is an almost universal major drawback. There is approximately one person to man 90 sq. km in a Thai National Park, and one person to about 340 sq. km in a wildlife sanctuary in that country. Lack of personnel is also acutely felt in Sri Lanka, Burma and Indonesia, and those that are in the field are inadequately paid.

Inadequate enforcement of law, inadequacy of the laws to assist appropriate management and protection, and the leniency of the law courts in dealing with offenders, was noted in varying degrees in Thailand, Indonesia, Philippines and Bangladesh.

The threat of hydel and irrigation projects affects the Silent Valley and the Indravati National Park in India and Taman Negara in Malaysia, to name a few. It has already inundated prime habitat in the Corbett National Park in India.

Feral buffaloes in Yala and Wilpattu National Parks of Sri Lanka, particularly in the former where they number about 15000; are a cause of serious overuse of the areas they concentrate upon, especially around the "villüs" or lakes.

The lack of trained personnel is universal, and is the single most important factor impeding data collection and scientific management. This is also a major reason why comprehensive surveys to determine status and distribution of endangered species have not been adequate.

The consequential stoppage of fishing and other exploitation has been the main cause why estuarine, coral and other important coastal areas have been so poorly covered under the protected areas system. Important turtle breeding areas are still left to the mercies of the egg collectors and in Sri Lanka and India coral is still being collected to produce lime.

Tourism is still in its infancy in the parks and sanctuaries of the region. However, in parts of Yala and Wilpattu National Parks of Sri Lanka. Periyar in South India and Khao Yai in Thailand, excessive concentration and overuse in some restricted areas, is being felt.

In Vietnam, Kampuchea and Laos, an area justly famous for its wildlife and holding rare and localised life forms like the Kouprey, *Bos sauveli*, the Imperial and Edward's pheasants, *Lophura imperialis* and *Lophura edwardsi*, the ravages of a fierce and long-drawn war resulting in both hunting and habitat destruction, including defoliation through chemical warfare, has meant a very severe set-back to all conservation efforts in the region. The impact of 50 million Kgs of pesticides sprayed over 2.4 million hectares in South Vietnam (Mc Neely 1975), cannot but be lethal to all wildlife. The unsettled conditions in this whole region precludes setting up of effectively protected areas, at least in the near future.

The activities of the shifting cultivators—kaingineros—and the fires that they cause resulting in the conversion of woodlands into 'Cogan' or *Imperata* grasslands, is the biggest law enforcement problem in the Philippines National Parks (Grimwood 1974). The field officers in the charge of these parks are further handicapped by the fact that they are not the masters of these areas under their jurisdiction, being subordinate to the local forest staff. And logging still poses a threat to the protected areas of Southeast Asia. Both Taman Negara and Endau Rompin in west Malaysia are so threatened, and the 73,000 hectares Mt. Apo National Park on Mindanao Island in the Philippines, containing several endemic species and a population of the extremely endangered Philippines eagle, *Pithecophaga jefferyi*, may be reduced to less than 14000 hectares to accommodate settlers and logging interests (Myers 1979). A saw mill has been established close to Gunung Leusar, the most important of Sumatra's protected areas and one of the last strongholds of the Sumatran rhinoceros, *Dicerorhinus sumatrensis*. 30,000 hectares of prime lowland dipterocarp forest in the Sikunder area, a part of Gunung Leusar, has been ceded for logging, Kerumutan Reserve (120,000 ha) and Way Kambas (130,000 ha) also in Sumatra, have both been logged and destroyed, even though the latter was specially set up to protect the Sumatran rhino. Commercial plantations have been carried out in the Baluran Reserve (UNDP/FAO, 1976), and large chunks of the natural forests of the Bail Barat Reserve in Bali have been converted into teak.

5. Factors Which have Encouraged the Establishment and Effective Management of Protected Areas

This grim tale of dessication and lost ground would seem to suggest that the cause is lost. On the contrary, both the intelligentsia and the decision-makers are rapidly coming to accept the fact that protected areas are the future hope of natural forests and fauna, and that these areas have a usefulness even otherwise.

One of the best and easiest way to save an important watershed is to establish a protected area there. It is an interesting phenomenon that whilst the people come to accept the complete stoppage of exploitation as should be and is with most national parks, it is far more difficult to enforce controlled usage which the wildlife sanctuaries mostly strive to achieve. Once the principle of non-use comes to be accepted, as it does surprisingly soon, the clamour dies down. On the other hand, controlled exploitation and rotational grazing for instance, are a constant source of friction and defiance in wildlife sanctuaries. Thailand has overcome this problem by making their wildlife sanctuaries free from exploitation and thus on a par with the national parks in this regard.

In China, the purpose for the establishment of protected areas is fourfold—for the protection of the whole natural landscape; for the protection of special types of ecosys-

ems; for the protection of rare species of animals and plants, and for tourism and recreation (Wang Huen-pu 1980).

In India, the tiger was made the mascot for the conservation of sizeable diverse habitats of this great carnivore.

According to the UN list of national parks and protected areas, the protected areas system of the Indomalayan realm which began with the establishment of the first area in 1918, covering 32,633 ha, had increased to 10 areas in 1928 extending over 229,636 ha. By 1938 the number had increased to 43 with an area of 3,312,854 ha; by 1958 to 85 areas encompassing 4 742,055 ha, and by 1968 to 116 areas covering 6,486,791 ha. Thereafter the increase has been dramatic. By 1972 there were 150 protected areas and by 1978 there were 257, covering an area of 16,389,417 ha. By the latest count there were 292 areas protecting 22,275,030 ha (source IUCN, 1982).

Most countries of the region have also sizeably enhanced their allocations for nature conservation. In the Bangladesh First Five Year Plan (1973-1979), a financial allocation of TK 20.06 million was sanctioned exclusively for the preservation of tiger habitat in the Sunderbans. Indonesia's Third Five Year Plan in which conservation is being given priority, there is a budget of approximately 2 million dollars for 1978/79 and a projected three-fold increases in the total area of reserves to 10 million hectares. The WWF has also pledged a support of $ 1.2 million to Indonesia.

In India, 80.9 million Rupees (US$ (10,01 million) have been spent over a seven year epriod under Project Tiger and a total of 150 million Rupees (US $ 15.16 million) has been earmarked for it in the current Five Year Plan. The World Wildlife Fund is assisting with an additional 1 million dollars. The Federal Government also gives financial assistance to State Governments in conservation projects like the conservation of the three crocodile species and the conservation of important protected areas. The State of Jammu and Kashmir is earmarking 4.8 million Rupees for the conservation of the Dal Lake watershed which will benefit the Dachigam Sanctuary, the only safe haven for the gravely endangered hangul or Kashmir stag.

West Malaysia will be spending the equivalent of US $ 8 million on nature parks, reserves and on the conservation cum management of wildlife. Special attention will be given to the conservation of endangered species like the Sumatran rhinoceros, seladang, elephant, tiger and tapir.

In Thailand, the budget of the Wildlife Division of the Royal Forest Departmet has increased from approximately US $ 400,000 three years ago to about US $ 700,000 in 1978, though it is much less than the demand.

There is another factor which augurs well for both establishment and improved management of protected areas. Most nations have established separate departments and ministries for the environment, and though the management of wildlife and national parks still remains under the aegis of the forest departments in most countries, separate agencies or specialiastion within the administrative set-up, are coming about. No more are the wildlife sections the dumping grounds of unwanted personnel of the forest department. Though the youthful lot that is now coming into the field and at managerial levels is not widely trained in wildlife management, they have travelled and have been exposed to the conservation philosophy. What were a handful of conservation enthusiasts scattered about in some of the countries ten years ago, have now become a nucleus in each country, a band of determined and dedicated managers.

6. Current Status of the Protected Areas in the Realm

An examination of the biomewise coverage of the protected areas of the world's various biogeographical realms, reveals interesting facts. 152 of the 355 protected areas in the tropical humid forests, and 161 of the 482 areas in the tropical dry forest and woodland biomes, are in the Indomalayan realm. There are, however, only 2 protected areas in warm deserts and semi deserts out of a world total of 171, and 11 in the mixed mountain systems out of a total of 344, in the Indomalayan realm. This is partly understandable as it is due to the topography and the vegetation. But what is not encouraging is the fact that there are no tropical grasslands, nor lake system, nor mixed island system biomes represented in the protected areas system of that realm (Source IUCN, 1982).

6.1 Protected Areas by Biogeographic Province

The above mentioned preponderance of the coverage of heavy forests and the relative and even total negligence of arid and semi arid areas, grasslands and of island ecosystems, is reflected in the distribution of the protected areas in the various biogeographical provinces of the Indomalayan realm. There are 20 protected areas in the Malabar, 24 in Indochinese, 8 in south Chinese, 14 in the Sumatran, 19 in the Javan, 11 in the Celebesian, and 30 in the Bornean and 11 in the Malayan rain forests. There are 80 areas in the Indus-Ganges, 27 in the Thailandian and 30 in the Ceylonese monsoon forests. The Burman rainforest and monsoon forests, with 1 and 6 areas respectively, are poorly represented, as is the Ceylonese rainforest with only one area protected. But the drier forests, thorn forests, grasslands and island ecosystems are in the worse predicament. The Coromandel biogeographical province has only one protected area—Point Calimere—the Deccan thorn forest 2, and the Thar desert another 2. The Philippines has 8 areas listed, but Taiwan only one—the Iriomote Island of the Ryukya group under Japan, and the only home of the unique and endemic Iriomote wild cat, *Mayailurus iriomotensis*. The Seychelles and Amirantes Islands,

Laccadive Islands, Maldives and Chagos Islands and the Andaman and Nicobar Islands have no protected areas listed at all. Yet these islands contain highly endemic and rare fauna, particularly avifauna, such as the Seychelles magpie robin, *Copsychus sechellarum*, the Seychelles owl, *Otus insularis*, the Seychelles warbler, *Nesillas sechellensis*, the Nicobar megapode, *Megapodius freycinet nicobarensis*, and the Andaman teal, *Anas gibberifrons albogularis* (Source IUCN 1982).

12 Protected Areas by Country With Variations in Geographical Area Converage

Sri Lanka with a total of 33 listed protected areas covering 9.12% of the country, Thailand with 52 listed areas covering 6.76% of its geographical area and Malaysia with 9 areas covering 10.70% of the country, lead the others in the percentagewise geographical areas under the national protected area system. At the other end of the list are Kampuchea with one protected area—the Angkor Way National Park—and Laos, Viet Nam and Maldives with none each. Nepal has 7 areas listed, convering 3.23% of the total area of the country; Pakistan 4 covering 0.46% the Philippines 8 encompassing 0.73%, Burma 6 covering 0.67% Bhutan 1 covering 11.62% and Bangladesh 9 covering 0.66% of the country. India has 117 areas listed, covering 2.48% of the country and Indonesia 78 areas encompassing 3.47% of the land (Source IUCN, 1982).

13 Strength, Weaknesses and Gaps

The main aspects have already been discussed at some length in divisions 4 and 5 above and are not repeated here. There are some features, however, which need to be elaborated upon and others discussed.

Though some of the major mountains like Mount Kinabalu, at 4050 metres the highest mountain in Southeast Asia, are covered under the protected areas system, many of the unique and significant volcanic and other features and mountain ranges are not so protected in the tropical regions of the Indomalayan realm.

Marine areas are very poorly represented in the protected areas system as noted above, and those that have come about like the outstanding Tarutao National Park on the boarders of Thailand and Peninsular Malaysia, is still heavily fished and corals destroyed by explosives to kill the fish. Lagoons like lake Chilka on the Orissa coast in India, the largest lagoon in the region; coral areas like those off Rameshwaram in the gulf of Manaar, south India, and large inland drainage lakes like Lake Tonle Sap in Kampuchea and Lake Toba in Sumatra, are outside the pale of the protected areas system. Though both Bangladesh and India have established tiger reserves in the Sunderbans, the largest single mangrove area in the world, mangrove areas by and large are poorly represented in the protected areas system, particularly in Thailand, Burma, Malaysia, Philippines and Indonesia (Christenson

1979) More protected areas which would lead to lesser exploitation, are also needed on the Trengganu coast of west Malaysia to protect the rookeries of the leathery turtle, *Dermochelys coriacea*. In East Malaysia off the coast of Sabah the turtle Island National has been established in 1977, but the adjacent breeding grounds on Philippines territory need protection.

Belatedly, wildlife research is gaining momentum in some countries. In Malaysia research has been undertaken amongst others, on the great argus pheasant, *Argusianns argus*, the Sumatran rhino, tiger, elephant, Seladang, *Bos gaurus*, and tapir, *Tapirns indicus*.

In Indonesia, with the collaboration of foreign scholars, research has been and is being carried out in a number of areas, notably in Udjung Kulon and Nunung leusar. The anoa in Sulawasi, the Javan tiger, *Panthera tigris sondaica*, in Meru Betire and some of the apes are also subjects of study. In India, research has been carried in the Gir National Park, particularly on the lion, *Panthera leo persica*, in Kanha, particularly on the tiger and the central Indian barasingha, *Cervus duvauceli branderi*; and in Bandipur, particularly on the Chital, *Axis axis*, and the wild dog, *Cuon alpinus*. Research has also been carried out on the behaviour and ecology of the lion-tailed macaque, *Malaca silenus*, the common langur, *Presbytus entellus*, the great Indian bustard, *Choriotis nigriceps*, and the blackbuck, *Antilope cervicapra*; In Thailand, the Kasetsart University and the Department of Agriculture are carrying out uself applied research. Elsewherc, research in wildlife aspects needs a very great impetus. Furthermore, the research topic that have been undertaken are largely the more spectaculrr mammalian and bird species. Very little work has been done as yet on the ecosystems of the region and the effects of demographic and biotic factors that are brought to bear upon these ecosystems.

The urgent need for trained personnel to man the protected areas has been already mentioned. With the number of protected areas that are available, it is not a very viable preposition to start an elaborate trainining school in wildlife management at the national level, with the exception of India and Indonesia. India has started a training programme at Dehra Dun over a decade ago. A school of Environmental Conservation Management has been established at Ciawi near Bogor, in Indonesia. The curriculum is comprehensive. But what really is required is a regional school for wildlife management which would enable the trainees from countries who do not or cannot start their own training programme, to benefit. The teaching staff, the equipment and the scope of teaching could be expanded to fulfil the needs of a regional school, to the benefit of all trainees, and the rapport that would be established amongst the individuals from the different nations of the region would stand in very good stead, and the co-operation that it would result in would be very helpful in the formulation and implementation of international conservation policies and

conventions. In fact, such a training school at present would perhaps be the single greatest need at the regional level in the field of nature conservation in the Indomalayan realm.

Special Topics Relevant to the Realm

The Project Tiger Case Study

Of the case studies that have been carried out for the purposes of this Congress in the Indomalayan realm, the author has had an opportunity to see only one, namely, the one pertaining to the Project Tiger in India, carried out by Mr. H.S. Panwar. The study relates to one of the great success stories of the world conservation movement. It has a special relevance to the Asian scenario, as to how despite all the constraints of heavy demographic pressures and a federal system of government, despite all the financial stringencies and lack of precedents, large and diverse ecosystems were set aside for nature conservation. In the process the tiger became a symbol and a rallying point, and the impetus that it gave to conservation consciouseness and commitment has been perhaps the greatest indirect benefit and impact of the Project. The study discusses the various aspects and achievements of habitat rectification, of compensatory development, of the concept of core areas of total protection surrounded by buffer zones which, for demands of consumptive uses, cannot be added to the core areas and hence in which regulated exploitation would be allowed and which, in effect, give a defence in depth to the curcial core areas within. The 11 Tiger Reserves that exist at present represent core areas of totalling 5142 sq. km and a total protected area 15,800 sq. km 4 new reserves are proposed to be set up.

Over 10 million US dollars have already been spent and the core areas represent an annual loss of revenue, through non-exploitation, of approximately $ 11.11 million. 40 villages holding a population of 6000 have been relocated ontside the Reserves and a grazing incidence of a 100 thousand head of cattle has been eliminated. The tiger population in these Reserves has more than doubled, as it has almost doubled in the country. But of equal importance is the fact that the seasonal streams that flow from these areas are becoming perennial with the improvemens of the water regimes, and for more grass in the buffer areas is available than was before the imposition of regulatory grazing.

There are two aspects pertaining to the Project, as with other conservation efforts in the whole area, which need to be highlighted. Firstly, research activities and collection of basic data needs to be given a great boost. Without these the areas would continue to be protected rather than managed. Secondly, though the areas have been secured and appear secure and strong for the present, no protected area in a densely populated democratic country can remain sacrosanct in perpetuity unless the people, especially the local people, support

the programme. This involvement of the people in the Project is the greatest challenge and should be now the greatest long-term objective that the Project should address itself to.

7.2 Legislation

Though it would be impossible to discuss here comprehensively even the major features of the national legislations dealing with wildlife conservation and national park management, some salient aspects are brought forth.

The legislations of the region still emphasize mainly the protection aspect. The conservation factor involving the management of both animate beings and areas, is usually rather inadequately covered. Even the term wildlife is frequently interpreted to donate wild animals and birds and is often not given the internationally accepted broader connotation to embrace all flora as well as fauna living in a state of nature. The emphasis by and large is still upon species protection than on a holistic area management.

Some of the legislations like that of Sri Lanka is confined to state-owned lands and therefore, do not have an applicability to the whole country. Certain countries like Thailand and Malaysia have separate legislations for the protection of wildlife and for the management of national parks. Most of the legislations pertaining to the protected areas do not incorporate a zoing concept accepting the principle of different management practices in different parts of a given area.

Barring the Indian Wildlife (Protection) Act of 1972, most of the legislations deal inadequately with the control over trade and taxidermy in wildlife and wildlife products. Thailand is one example. Adherence to international conventions like the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), are not always adequately reflected by consequent modifications and provisions in these legislations. The role of tourism and its regulation in protected areas is also not always adequately covered.

The provision in the legislations of Malaysia, Pakistan, and India pertaining to presumpations, whereby if it is established that a person is in possession of an animal or animal product, it shall be presumed that until the contrary is proved, the burden of proving which shall rest with the accused, that the person is in an unlawful possession of these commodities, is worth emulation in the other Acts.

The provisions of minimum deterrent punishment including mandatory imprisonment in certain offences which exist in the Indian legislation, as well as the powers of confiscation of tools, weapons, vehicles connected with the offence that exist in the Indian and Thai Acts, are also worth following. Also worthy of note is that in the Thai legislation the destruction of habitat in protected areas attracts the heaviest punishment.

However, the greatest need is not the revision of existing laws important though it is, but the adequate enforcement of the existing legislation.

7.3 International Conventions

CITES is the most significant international convention related to the utilization of natural resources applicable to this realm. Pakistan, India, Nepal Sri Lanka, the Philippines, Malaysia and Indonesia have joined the convention. Unless, however, Singapore implements this convention, it shall continue to be very difficult to prevent the illegal traffic in wildlife and wildlife products from the neighbouring countries.

All of the countries have signed the World Heritage Convention and the Ramsar Convention on Wetlands (Source IUCN, 1982).

7.4 Conservation Education

Conservation or environmental education at the school level as yet remains largely undeveloped. Some attempt at curricula formulation and the imparting of basic knowledge has started in a few places, but by and large this crucial area needs an urgent and universal emphasis.

Environmental education, mainly vocational oriented, has started in some of the universities of the region, notable amongst them being the Benaras and Saurashtra Universities in India, the Chulaloagkorn and Kasetsert Universities in Thailand, the University of Malay and the University of Padjadjaran at Bandung, Indonesia.

7.5 Non Governmental Organization (NGO)

Perhaps the most useful contribution that such organization can make to nature conservation is in the field of education and popularization of the conservation precepts, and in the field of research and data collection.

Some organisations like the World Wildlife Fund (WWF), particularly in western India and Malaysia, have initiated educational programmes which include field visits. This is also being undertaken by the Association for the Conservation of Wildlife in Bangkok, and Lestari in Jakarta, Indonesia.

Institutions like the Malayan Nature Society, the Bombay Natural History Society, the Wildlife Preservation Society of India and the Sri Lanka Wildlife Society which have been in existence for some decades, publish periodicals and have been forums of technical experts and conservationists that continue to exert influence both upon the national governments and the people.

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National Parks of Madhya Pradesh—Part I

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Introduction

Madhya Pradesh, being in centre and the largest State of India is well forested. It has 37.52% of total land area under forest with much varied wildlife (Anon, 1976). The State Government and the public are conscious of their wildlife heritage and the wildlife is protected in many pockets in this State since 1879 ? At present Madhya Pradesh, leading in the country in having well notified three national parks namely, Kanha National Park (1955) Madhav National Park (1956), and Bandhavgarh National Park (1968). These national parks are well managed and ably looked after and are contributing a significant amount to the State Exchequer (Text fig. 1).

Wildlife is a natural renewable resource which is presently under great pressure of human population and it will receive increasing pressure in future both by the increase in human population and due to country's getting more urbanised with greater transport facilities. Like other resources of the country, the use and management of the wildlife resource too, must be improved if the need of future generation are to be adequately met. Due to excessive use of any area, inadequate improvement and insufficient maintenance, it is bound to be downgraded in quality. To check this, it is necessary to have a proper planning for proper management. For the desired results, proper planning and design of physical facilities are of extreme importance as they promote use and enjoying by visitors as well as economy of operation and at the same time lead to protection of basic recreational interest.

The present paper deals with the description of the national parks of Madhya Pradesh. The location, the topography, the flora and the fauna of these national parks are given. Except for a list of mammals and birds of Bandhavgarh National Park (Sinha, 1977 and 1978) no published record is available of birds and mammals of these national parks. The list of birds and mammals of the three national parks are given in table 1, which was

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prepared during the survey of Kanha National Park between 1970 and 1978 and of Bandhavgarh National Park between February and March, 1976, by the senior author (N.K.S.). The list of Madhav National Park was prepared by the other author (R.K.S.), during the survey of the park in September to October, 1975. Because of absence of shooting permission inside the national parks, most of the identification is based on sight records, which was supplimented by the list of birds änd mammals given in the management plans (Nath, MSS, Dixit, MSS and Anon, MSS) and from the old collection kept in the Zoological Survey of India, Central Regional Station, Jabalpur. The list of other smaller animals collected during the surveys will be published elsewhere. The classification in this paper has been followed after Ripley (1961) for birds and Ellerman and Morrison-Scott (1951) for mammals.

Acknowledgements

Thanks are due to the Director, Zoological Survey of India, Calcutta and to the Officer in Charge, Central Regional Station, Zoological Survey of India, Jabalpur. for facilities and encouragements.

Kanha National Park

The Kanha National Park extended in two districts, Mandla and Balaghat of Madhya Pradesh, was constituted as national park in the year 1955. At present this national park has an area of 940.00 sq. km.

LOCATION : Lies in the Maikal Range, a branch of eastern part of the Satpura hills. It lies between lat. 22° 24′ and 23° 13′ N. and long. 80° 32′ and 80° 45′ E. and is about 54 km. south east of Mandla town. It can be approached from Mandla via Chiraidongri on Mandla —Nainpur road and via Orai on Mandla—Raipur road. From Balaghat it can be approached via Baihar.

TOPOGRAPHY : It is a stretch of wild and hilly country. The northern part of the national park is a broad table land surrounded in circular manner by range of hills about 914 metres high. The southern part is mainly hilly with chain of hills of varying heights. There are numerous valleys of different size interspersed in between these hills. The hill tops are flat. Bulk of the area of the park lies within these hills but the forest extends down the outward slopes till cultivated plains are reached in the east and the west. The main portion of the park is a plateau rising upto 893 metres above MSL. The north central Kanha—Srawantal meadow in which the large mammals congregate in summer is 596 to 622 metres in elevation. There are many small and large sized grasslands which were originally created by *Baigas* (an aboriginal tribe) for there shifting cultivation. These meadows occur along the courses of large streams and on low lying plains or on areas of black cotton soil. Large sized grass lands also occur on flat top of hills locally known as *Dadars*.

NATURAL HISTORY : The park is the öldest wildlife reserve in central India. It was declared as reserve in 1879. Till 1931 no serious effort was made for wildlife protection and to develop it. But in that year this has been declared as special shooting block for the preservation of fauna and flora for study and pleasure. On 16th May, 1935, Kanha then known as Banjar Valley Reserve, was notified as sanctuary with an area of 233 sq. km. In 1943, the area of the sanctuary was reduced to 134 sq. km. The area of the sanctuary was reincreased to 253 sq. km. in 1952. In 1955 the Madhya Pradesh National Park Act was formed and Kanha was declared as national park from 1.6.1955 with an area of 253.04 sq. km. The area was extended to 318.44 sq. km. in 1964 and to 446.69 in 1971. In 1976 two adjacent wildlife sanctuaries namely Supkhar and Maikal of Balaghat district have been merged with Kanha National Park making its area to 940.00 sq. km.

GEOLOGY : The geology of the area is associated with the formation of the Deccan trap, which was formed by the flow of lava at the end of cretaceous period. The lava errupted is chiefly fluvial basalt with volcanic tuffs, ashes and some rudimentary beds. The common soil of the trap areas in the low lying portions is the stiff clayey black soil or black cotton soil. In other parts, the soil is pale or yellow sandy commonly known as '*Sahara*'. The slopes of the hills are covered by dark or reddish ferruginous sandy loam derived from metamorphic rocks. The top of hills are the laterite soil with high percentage of alumina which are flow of basaltic caps.

WATER SUPPLY : The park is the catchment area of the Banjar river which is main tributary of the river Narmada. The main tributaries of the Banjar river in the park are Bagmer nadi, Sulkum nadi, Ganghar nala, Kanha nala, Nila nala, Desi nala, Surwahi nala, Nigga nala and Churhi nala. Most of these streams are perennial, although most of them cease to flow by March and water remains only in pools and few seepage springs in the hills. Besides the above streams, there are numerous seasonal streams flow in the park. Srawantal, Kisli and Devtal are the only perennial tanks in the park. During the pinch period more than 2/3rd of the pools remain in the central Kanha area. Rainfall is fairly heavy with average of about 1825 mm (Nath, MSS), although the senior author has recorded 2606 mm and 2568 mm rainfall in 1970 and 1971 respectively. 95% of the total rainfall is during rainy season (June– October).

VEGETATION : The hills contain forest of sal (*Shorea robusta*) in the lower reaches and on the undulating areas between 548 to 610 metres above MSL. The sal leads to mixed forest contains various types of trees such as *Lagerstremia parviflora, Boswellia serrata, Diospyros melanoxylon, Cochlospermum religicosum, Dalbergia latifolia, Anogeissus latifolia, Buchanamia lanzan, Acacia torta* etc. on higher slopes above 610 metres MSL. and to grassy

meadows in the low lying areas. The sal in sal forest is about 95%. The transition from sal to mixed forest and to the grassland is often abrupt. The mixed forest frequently have a dense undergrowth of bamboos. The grass meadows contain variety of grasses common of which are *Anthristiria ciliata, Pennisetum alopecurus, Themeda triandra, Heteropogon contortus, Andropogon brevifolius, Imperata cylindrica, Cynoden dactylon, Isilema iaxum, Saccharum spontaneum, Vetivaria ziziniodes* etc. The grass meadow occur along the courses of large streams and in low lying places or on areas of black cotton soil.

WILDLIFE : The Banjar Valley now known as Kanha National Park has been better known for its wildlife. Practically all forms of wildlife of plains of India except the elephant and the lion are met within the park. The park is famous for its swamp deer and the tiger. Wildlife seen here include the gaur, the largest existing Bovidae, the blackbuck, the only representative of the genus and many others. It was recorded in the park that the wild buffaloes and the elephants were regular rain visitors in eighteen nintees. The list of birds and mammals found in park are given in Table 1.

Madhav National Park

The Madhav National Park, commonly called as Shivauri National Park is situated in Shivpuri district of northern Madhya Pradesh. It was constituted as national park on 1.1.1959. At present this national park occupies an area of 156.16 sq. km.

LOCATION : It lies on the Vindhyan range and the park boundary lies on the eastern outskirts of Shivpuri town. The national park is situated on the Agra—Bombay national highway (NH 3) at about 115 km south of Gwalior. The Shivpuri—Jhansi national highway (NH25) also pass through the park. It lies between lat. 24° 50′ and 25° 55′ N. and long. 77° 15′ and 78° 30′ E. in Shivpuri district. The park can be approached by road from Shivpuri Jhansi and Guna.

TOPOGRAPHY : The park area comprises of comparatively low hills of Vindhyan range forming a series of super imposed terraces, of hilly country. The normal elevation of park varies from 360 to 480 metres above MSL, with undulating grounds and low hills. There are numerous valleys of varying sizes interespersed between these hills. The forest extends down the outward slopes until cultivatd field are reached. The main attraction of the park is its Sakhya Sagar lake and Madhav lake which are huse and perennial and are situated in the centre of the park There are 112 km all weather metalled road inside the park area which enable the tourists and naturalists to witness and study the wildlife in its natural habitat in all the corners of the park. All around the central Sakhya Sagar and Madhav lakes, there are number of watch towers from where one can get a view of the park.

NATURAL HISTORY : The forest of the park was a personal game reserve of the ruling family of Gwalior Raj in the past. After merger of the State to Central Province it was decided to establish a national park at Shivpuri, and the work in this line was started in 1954. The work on the decisions taken by the Central Province Government was continued and the Madhav National Park was constituted by a Government of M.P. notification from 1.1.1955, with an area of 156.16 sq. km.

GEOLOGY : The area include the granites—gneiss complex of archean age which are forming the low lying areas and small isolated hills. The rocks are overlain by Vindhyan formation as well as trap and infra trappeans, The Vindhyan formation include fine to medium grain, light coloured sand stones and bluish gray lime stone. The infra trappeans also include loose frible sand stone and sandy lime stone which are confirmly overlain by dark coloured compact basaltic lava flow. The basaltic lava flow have been latiritised which on weathering give rise to brownish black coloured soil which normally transported from the hill to the valley portions while Vindhyan sand archean formations normally give rise to sandy soil.

WATER SUPPLY : The park falls under the catchment area of Sindh river which joins the river Yamuna in neighbouring State of Uttar Pradesh. Besides having two large perennial lakes, there are a number of nalas which ultimately joins the river Sindh. The water is retained in these nalas at some places in form of pools. Due to excellent situation of the two lakes, wildlife congregate in large number fearlessly around the lakes where green fodder is available due to humidity in soil. The grass rhizome are more attractive around these lakes for the wild boar and the porcupine. The average annual rainfall is about 900 mm.

VEGETATION : Forest is northern tropical dry deciduous mixed with not much difference with the surrounding forest of the area. Due to not much variation in the altitude the vegetation is also similar in most part of the park. The forest on the undulating grounds, low hills and in valleys are covered by low forest of which the common trees are *Acacia catechu, Acacia arabica, Anogeissus latifolia, Boswellia serrata, Diospyros melanoxylon, Syzygium cuminii, Tarnarindus indica* etc, The forest extend down the outward slopes until the cultivation started. There are grass meadows on the low lying areas and around the two lakes.

WILDLIFE : The highest concentration of wildlife in this northern part of the Madhya Pradesh is astonishing and credit for their abundance goes to the ex rulers of Gwalior State under whose possession the park area remained as their private shikar reserve prior to merger of the State with the union of India There are plenty of antelopes viz. the blue bull the blackbuck, the Indian gazelle or chinkara in the park. Among the deers

the chital are out numbering all other animals. The sambert population is satisfactory. The wild boar is also seen around the marshy land digging the soil for rhizome of the grasses. A very urprising situation exists in the park due to negligible number of predators as compared to herbivore population. The detailed list of bird and mammal fauna are given in Table 1.

Bandhavgarh National Park

The Bandhavgarh National Park comes under the jurisdiction of Umaria Forest Division of Shahdol district and was constituted as national park in 1968. The park was private shikar reserve of ex Maharaja of Rewa in the past and is surrounded by forest blocks of Tala range. The park is spread in an area of 105.00 sq. km. and is rectangular in shape.

LOCATION : Lies between lat. 23°36′ and 23°42′ N. and long. 83°57′ and 81°6′ E. and about 33 km. from Umaria railway station on Katni—Shahdol sectiond of S.E. Railway. Rewa is 128 km. from the park gate. It can also be approached from Sidhi as well as from Shahdol by road.

TOPOGRAPHY : The area of the park consists of many hills and hillocks of varying sizes interspersed with large number of varying sized valleys. The ground is undulating and top of hills are flat. The altitude varies from 440 metres in the valleys to 811 metres above MSL on the highest ridge top. The central hill is largest with 281.25 sq ha. flat plateau. The ridges of this plateau are practically vertical and difficult to climb, making the plateau a natural fort, and is called as Bandhav Garh (Garh = fort), which is still under the control of ex Maharaja of Rewa. 12 tanks and few wells are present on the flat plateau of this fort, which is a natural wonder. The largest tank is 130 metres long and 100 metres wide with 40 metres depth. This was created by cutting the stones. Below this fort large number of caves were cut on the rocks which is a great tourist attraction. The lower portion of valleys are grassy meadows locally called *Bah*. Most of these Bah's are marshy land with seepages from ground.

NATURAL HISTORY : Bandhavgarh was capital af Rewa State since thirteenth century, when it was given to Baghel rulers as dowry by Karchuli Kings, to beginning of seventeenth century. Since shifting of capital of Rewa State from Bandhavgarh to Rewa the human population also started moving slowly from this fort and by 1935 it was deserted completely. Still many remains of human settlement are present in from of houses, palaces, tanks etc. The fort and its surrounding areas were the private shikar reserva of ex Maharaja of Rewa and no ordinary public was authorised to make shikar in this reserve. When the State was merged to Central Province after the independence the fort area remained with the Maharaja and due to this and for regard to Maharaja by the local people, the large scale slaughter on wildlife was not witnessed in this area. The fort area and its surrounding forest was declared as national park in 1968.

GEOLOGY : The soft felspathic sand stone of medium to coarse texture of Supra—Barakar are the main geological formation of the park. The Vindhyan sand stone are seen in form of boulders and sheets. Rounded quertezits pebbles are embeded in the soft sandy matryx of the rocks. The river and the nala beds are fine sandy. The soil is brownish red or grey in colour. Alluvial soil deposits are met in low lying areas.

WATER SUPPLY : The park falls under the catchment area of river Sone. There are two perennial nalas, Charanganga which originates inside the park and Damnar nala, present in the park. There are other important seasonal nalas viz. Chachahi, Bhadar and Chamkuli which retain water in from of pools. There are 12 tanks of various sizes present in fort area. These are perennial. There are many marshy areas with seepages from ground available in the park especially on low lying meadows. The mean annual rainfall is 1173 mm.

VEGETATION : The forest of the park is classified as tropical moist deciduous. The forest has been divided in three zones viz. sal forest having more than 20% trees of sal and is in low undulating and plain tracks. The sal forest is spread in about 57% area of the park. The common associates of sal are *Terminalia tomentosa, Anogeissus latifolia, Ougeinia oojeeriensis, Acacia catechu* etc, The sal forest leads into mixed forest on the upper slopes.

The mixed forest spreads in about 35% area of the park. The common trees of the mixed forest are *Boswellia serrata, Lagerstreemia parviflora, Dalbergia peniculata, Terminalia tomentosa* etc. The rest of the area are mainly grassland. These grasslands are locally called as *Bah*. The common grasses are *Saccharum spontaneum, Phragmites karks, Imperata cylindrica* etc. The clumps of bamboos are scattered everywhere on hills slopes.

WILDLIFE : The area of the park was privileged of being the private shikar reserve of ex Maharaja of Rewa and still a good number of wildlife is present in the area. It is astonishing to see so much of wildlife in such a small national park. The barking deer, the sambar, the blue bull, the porcupine, the civet cat etc. are plenty and sure to be seen in every round in the park. Gaur is also seen occasionally. A variety of bats inhabit the caves and the birds are also plentiful in the park. The list of birds and mammals seen or collected in the park are given in Table 1.

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Part II—List of Birds and Mammals continued in next issue.

मनुष्य का अस्तित्व खतरे के कगार पर

वीरेन्द्र कुमार वर्मा

वन्य जन्तु प्रतिपालक, देहरादून

जन जीवन के विकास के लिये वनस्पति और जीव जन्तुओं का संरक्षण और संतुलन आवश्यक है। मनुष्य प्रकृति से इतनी दूर हट गया है कि सब प्राणियों तथा वनस्पति के परस्परावलम्बन की अनिवार्यता का महत्व समझना उनके लिये कठिन हो गया है। प्रकृति में समतोल, सौन्दर्य, शान्ति तथा धैर्य है तथा इसके विपरीत मनुष्य का जीवन कुंठित व संकुचित बनता जा रहा है। आजकल प्रकृति के कार्यों में बहुत ज्यादा हस्तक्षेप और अतिक्रमण हो रहा है। पृथ्वी पर प्रकृति के विकास में अरबों-अरबों वर्ष लगे हैं परन्तु हम कुछ ही वर्ष में उसका विनाश कर सकते हैं। वनस्पति ही एक मात्र फैक्टरी है जो अपनी खुराक को तैयार करके उस पर जीवित रहकर दूसरों को भी पोषित कर जीवित रह सकती है। आजकल मानव कृत्रिम औषधियों तथा वस्त्रों को बना सकता है परन्तु पूर्ण रूप से कृत्रिम खुराक पर निर्भर नहीं रह सकता है। मानव का भविष्य यन्त्रों पर नहीं बल्कि प्रकृति पर ही निर्भर है। इसलिये प्रकृति पुत्र वन्य जीव जन्तु तथा वनस्पति को कायम रखना अत्यन्त अनिवार्य है।

वन्य जीवों की रक्षा तथा उनसे प्रेम हमारे देशवासियों के लिये कोई नई वस्तु नहीं है। प्राचीन काल से हमारी संस्कृति की मूलभूत शिक्षा (अहिंसा परमोधर्मः) के आधार पर रखी हुई है। हमारे धर्म ग्रन्थ भी जीवों के प्रति प्रेम से भरे पड़े हैं। इतिहास के पृष्ठ उलटने पर तरह-तरह के वन्य प्राणियों की रक्षा के विषय में अनेक दृष्टांत सामने आते हैं। अंग्रेजों के शासन काल से पहले हमारे देश में वन्य जीव काफी सख्या में थे। किन्तु अंग्रेज शिकार के बहुत शौकीन थे जिन्होंने अपने शासन काल में वन्य जीवों का संहार खूब किया। बाद में यह प्रवृत्ति उस समय के राजाओं में फैली। भारतवर्ष स्वतन्त्र होने के उपरान्त देश में अधिक अन्न उपजाने का अभियान चला। जिसके फलस्वरूप कृषि के जिये वनों का सफाया किया गया। फसल को बचाने के लिये लोगो को बन्दूकों के लाइसेन्स अधिक संख्या में दिये गये जिसको मुख्यत: वन्य प्राणियों के संहार के लिये प्रयोग किया गया। इन सबका दुष्परिणाम यह हुआ कि पिछले ५० वर्षों से ३५ वन्य जीव प्रजातियां तो लुप्त हो गई है तथा अन्य कई प्रजातियां लुप्त होने की स्थिति में हैं जिनको यदि यथोचित बढावा व प्रोत्साहन नहीं दिया गया तो लुप्त होने की सम्भावना है। हमारे देश में लगभग ५०० से अधिक प्रजाति के जानवर, २००० से अधिक प्रजाति के पक्षी और ३००० से अधिक किस्म के कीड़े मकोड़े पाये जाते हैं। वन्य जीव प्राणी संवेदनशील होते हैं और वह मनुष्य की तरह लोई तथा कन्क्रीट के जंगल में गुजर नहीं कर सकते हैं। वह अपने अनुकूल वातावरण से पूरा तादात्म्य रखते हैं तथा बदली हुई फिजा में उम्र काटने के बजाय मर जाना पसन्द करते हैं।

दुनिया में सबसे पहले वनस्पति फिर पशु पक्षी और अन्त में मनुष्य आया। प्रथम वनस्पति एक कोषवाला हरा एलगाई था जो पानी की सतह पर रहता था। पर्णहरित की मदद से वह सूर्य के प्रकाश की शक्ति से अपनी खुराक बनाकर वायुमण्डल की कार्बन वायु का उपयोग करके हजम करता था तथा आक्सीजन फेंकता था। एलगाई के कोष कभी-कभी टूट कर एक से दो हो जाते थे और अपने वश को बढ़ाते थे। यह पृथ्वी पर प्रथम जैव्य वस्तु थी। धीरे-धीरे इससे बहुकोषीय जीव बनने लगे और विभिन्न कोष विभिन्न कार्यों को अपनाने लगे जैसे जड़ से कच्ची खुराक खींचना छिद्रों में पानी और आक्सीजन फेंकना आदि। इस प्रकार वनस्पति जगत के विकास के साथ-

साथ ज्यादा मिट्टी बनने लगी और इस मिट्टी में जैव्य तत्व बढ़ता गया। अन्त में एक कोष प्राणी अमीवा का जन्म हुआ। प्रथम प्राण का जन्म पानी में हुआ और करोड़ों वर्ष तक प्राण का विकास पानी में होता रहा। वनस्पति की उत्पत्ति में काफी विकास धीरे-धीरे होता रहा। ये सब वनस्पति और प्राणी एक प्रक्रिया में बंधे रहते थे और सब एक दूसरे पर निर्भर थे एवम् एक दूसरे के बिना जीवित नहीं रह सकते थे। इस विकास के क्रम में कई युग बीत गये। जल से निकलने पर कुछ जल, थल के रेंगने वाले प्राणी तथा उनसे नभ की चिड़ियाँ तथा स्तनपायी प्राणी इसी प्रकार उत्क्रान्ति चलती रही। इस प्रकार बहुकोषीय वनस्पति और प्राणी देखने, सूँघने, हजम करने, मलमूत्र आदि त्यागने, साँस लेने, सन्तान बनाने में विशेष कोष अपना-अपना कार्य करने लगे।

मनुष्य में पशुओं की अपेक्षा भावनाओं और बुद्धि का विकास ज्यादा रफ्तार से हुआ जिसने अपनी बुद्धि के सहारे वनस्पति, पशु पक्षी तथा अन्य जीवों पर अपने लाभ के लिये नियन्त्रण किया जिससे वनस्पति जगत पर बेरहमी से प्रहार हुआ। जिस बीज का विकास करने में प्रकृति ने अरबों वर्ष लगाये उसे थोड़े समय में बिना सोचे समझे अन्धाधुन्ध खत्म करते चले जा रहे हैं। यह नियन्त्रण इतना तेजी से हुआ कि इससे प्रकृति संतुलन टूटने का खतरा पैदा हो गया है और मनुष्य को अपने अस्तित्व का भी खतरा होने की सम्भावना है। वन और वन्य प्राणियों की सुरक्षा करने में अधिकांश व्यक्तियों को यह आशंका रहती है कि क्यों की जाये। आइये इस पर और गहराई से विचार करें।

प्रकृति संतुलन की प्रक्रिया सृष्टि के समग्र परिसर तथा जीवों के परिसर के परस्पर निकट अनुबन्धों पर निर्भर करती है। आक्सीजन, पानी, रोशनी, पेड पौधे, कीटाणु, पशु पक्षी और मानव सब एक विराट जीवन चक्र योजना के अंग हैं जिनका अस्तित्व एक दूसरे पर निर्भर है। हवा पानी जैसे भौतिक तत्व और जीव प्राणियों को अलग-अलग इकाई मानकर सोचना भयंकर भूल होगी मिट्टी में से पौधे अपनी जड़ों के द्वारा सेन्द्रीय पदार्थ (मृत प्राणियों से बना हुआ जैव्य तत्व) खींच रहा है। हवा और रोशनी की मदद से पौधा अपनी खुराक को तैयार करके बढ़ता है। मनुष्य और पशु उस तैयार खुराक को खाकर उसे हजम करके उसके अवशेषों को मिट्टी में छोडते हैं। पौधों के सूखे बीज, फूल, पत्तियाँ भी मिट्टी मे गिरती है। अन्त में प्राणी और पौधे दोनों मर जाते है और उनके अवशेष भी मिट्टी मे मिल जाते हैं। मिट्टी के अन्दर बैक्टीरिया और जीव जन्तु उन जैव्य अवशेषों को खाकर उन्हें पौधों की खुराक के अनुकूल परिस्थिति में छोड़कर अपने मलमूत्र तथा मृत शरीर के द्वारा पौधों के लिये नयी खुराक तैयार करते हैं।

वनों के नष्ट होने से हजारों मील दूर के समाज का जीवन नष्ट हो सकता है। विभिन्न वृक्ष जमीन से विभिन्न तत्वों को खींचते हैं। यदि यह हमेशा एक ही स्थान पर रहते तो उस स्थान की मिट्टी कुछ विशेष तत्वों से वंचित रहती है। हवा, पक्षी तथा अन्य जीव जन्तु की मदद से एक वृक्ष के बीज दूसरी जाति के वृक्ष के नीचे पहुँचते है और अधिक अच्छी तरह से पनपते हैं। एक एकड़ भूमि में मृत और जीवित बैक्टीरिया का वजन ढाई हजार किलो तक हो सकता है। जब पेड़ जमीन पर गिर जाता है तो उसके उखड़ जाने से प्रकृति मिट्टी में मानों हल चलाती है छोटे जानवर जैसे सांप, छिपकली, केचुये आदि सब अपने अपने ढंग से जमीन में हल चलाकर उसे नरम रखने में मददगार होते हैं। और अपना मलमूत्र व मृत शरीर जमीन मे छोड़ देते हैं जो कि प्रकृति के स्वस्थ अस्तित्व के प्रमुख नियम पर आधारित है जिसके बल पर मिट्टी जंगल के वनस्पति और प्राणी को पाल पाती है। पौधो की खुराक सिर्फ ५% ही जमीन से मिलती है शेष कार्बनडाईआक्साइड, हाइड्रोजन और नाइट्रोजन उसे हवा से मिलती है। क्लोरोफिल (पर्णरहित) की मदद से सूर्य के प्रकाश, कार्बनडाईआक्साइड तथा पानी प्रकाश

संश्लेषण प्रक्रिया से अपनी खुराक शर्करा बनाता है और वायुमण्डल में आक्सीजन व पानी देता है। पौधा कीड़े-मकोड़े, पशुओं और चिड़ियों का पोषण करता है तथा अन्य प्राणी भी उन पर जीवित रहते हैं। वनों के सफाया होने से तेजी से बहने वाले पानी का सामना घास नहीं कर पायी। घास कमजोर होती गई और उतना ही पशु उसे कुचलते चले गये और अंत में घास विलुप्त होने से स्थान रेगिस्तान बन गया। हमारे देश में वन क्षेत्र तेजी से घटते चले जा रहे हैं। वर्तमान समय में लगभग २०% भूक्षेत्र में वन हैं जबकि मैदानों में ३३% व पहाड़ों में ६६% वन होने चाहियें। वायुमण्डल में नमी रखने के लिये वनों का महत्व विशेष है। कलकत्ता विश्वविद्यालय के डा० टी० एम० दास के अनुसार एक मध्यम आकार का वृक्ष अपने ५० वर्ष की आयु तक जो सेवा करता है, उनका मूल्यांकन १५ लाख ७० हजार रु० आंका है जो कि निम्न प्रकार से दर्शाया गया है। वृक्ष से मिलने वाली लकड़ी, फल, फूल, छाल आदि इसके अतिरिक्त हैं।

(१) आक्सीजन का उत्पादन	—	रू०	२,५०,०००=००
(२) पशुओं के प्रोटीन का संरक्षण	—	रू०	२०,०००=००
(३) भूमि संरक्षण व भूमि उर्वकता पर नियन्त्रण	—	रू०	२,५०,०००=००
(४) वर्षा लाना तथा आर्द्रता पर नियन्त्रण	—	रू०	३,००,०००=००
(५) वृक्ष, पशु, पक्षियों एवम् कीड़े मकोड़ों को बसेरा देना	—	रू०	२,५० ०००=००
(६) वायु प्रदूषण पर नियन्त्रण एवम् निवारण	—	रू०	५,००,०००=००
कुल	—	रू०	१५,७०,०००=००

प्रकृति अपने आप समूह की आवश्यकताओं की पूर्ति की व्यवस्था करके असंतुलन पर नियन्त्रण रखती है। सब जीव जन्तुओं की प्रजनन क्रिया तेज वेग से चलती है। मिट्टी के अन्दर बैक्टीरिया एक घण्टे में दो बार अपना विभाजन करके अपने वंश को बढ़ाते हैं। यदि एक घण्टे में सिर्फ एक बार ही ऐसा हो तो २४ घण्टे में एक बैक्टीरिया की संतान १,७०,००,००० हो जाती है। ६ दिनों में उनका आकार अपने घर से भी ज्यादा बड़ा हो जाता है। लेकिन उन पर जीने वाले अन्य जीव जन्तु होते हैं जो उन्हें खाकर उनकी संख्या को संतुलित रखते हैं। इस प्रकार हर एक जाति एक दूसरे के नियंत्रण में सहायक होती है। कुछ चिड़ियां कीड़े मकोड़ों को खाकर उन पर नियम्त्रण रखती हैं। मेंढक मच्छरों को पकड़कर खाता है, सांप मेंढक चूहों आदि को; बाज, मोर सांप को तथा शेर गुलदार हिरन, सुअर, बन्दर आदि को। यह एक जीवन चक्र है जिसमें हर एक मारत भी है और मारा भी जाता है जिसका मनुष्य भी एक एक अंग है। इस संतुलित चक्र में तथा इस जाल में सबका अपना-अपना स्थान है। यदि मानव प्रकृति की पेचीदा व्यवस्था में हस्तक्षेप करता है तो खुराक के श्रृंखला की एक कड़ी में गड़बड़ी हो जाती है और जिससे सारी व्यवस्था टूट जाती है और इस प्रकार से मानव स्वयं अपने विनाश को आमंत्रित करता है।

यदि चिड़ियों को नष्ट कर दिया जाये तो कीड़े मकोड़े इतने बढ़ जायेंगे कि कुछ वर्षों में वनस्पति का नाश हो जायेगा और वनस्पति के बिना मनुष्य का जीवन सम्भव नहीं है। इसके अतिरिक्त पक्षी बीजों के वितरण में ही सहायता करते हैं और अपने मलमूत्र से जमीन को भी सींचते हैं। प्रत्येक पक्षी अपने घोंसले को एक विशेष जाति के पेड़ पर बनाती है जिससे आवास और खुराक के लिए परस्पर होड़ न हो। कोई भूमि के निकट रहती है तो कोई ऊँचे-ऊँचे वृक्षों पर और इस प्रकार से वन में सब प्रकार के वृक्षों पर पक्षियां रहती हैं। इसी प्रकार यदि सर्पों को नष्ट कर दिया जाये तो चूहे इतने बढ़ जायेंगे कि खेती और मनुष्यों को खतरा उत्पन्न हो जायेगा। शेर, गुलदार

आदि हिरन, सुअर, बन्दर आदि जैसे जीवों को खाकर फसल को नष्ट होने से बचाते हैं। भूमि के अन्दर हजारों किस्म के जीव जन्तु रहते हैं जिनमें से एक मुख्य केंचुआ है। दिन भर आगे पीछे जाने के लिये वह मिट्टी को मुँह से लेकर पाचन अंगों के बीच में से उसे आगे बढ़ाकर मलमूत्र के साथ निकाल देता है और इस प्रकार हजारों की संख्या में भूमि में रह रहे केंचुये भूमि को नरम और भुरभुरी बनाते हैं जिससे पौधों की जड़ो को आगे बढ़ने में सहायता देते हैं एवम् भूमि में सेन्द्रीय पदार्थ बारीक हो जाता है जो अन्य बैक्टीरिया के खाने के लायक तैयार होता है। ६ महीने में एक केंचुआ लगभग ९ किलो सेन्द्रीय पदार्थ अपने शरीर के द्वारा तैयार करके मिट्टी में स्वस्थ स्वरुप में मिला देता है। जिसकी प्रकृति को केवल एक इंच मिट्टी की सतह बनाने में ५०० वर्ष लगते हैं।

कृषि के लिए कीटनाशक दवाइयां उपयोग में लायी जा रही हैं जो कि आर्सेनिक से भी ज्यादा घातक होती हैं। डी० डी० टी० जीव प्राणी के यकृत तथा चर्बी में जमकर काफी घातक मात्रा में शरीरमे फैल जाती है। इन कीटनाशक दवाइयों में फासफोरस का उपयोग होता है जिसके मामूली छूने से काफी दुर्घटनायें घटती हैं। फसल पर जो विष अवशेष रहता है, वह छूने से कृषकों को लग जाता है। मरीज के स्पर्श से डाक्टर को रोग लग जाता है, कपड़ों को छूने से धोबी को लग सकता है। यह कीटनाशक दवाइयां एक दूसरे से मिलकर हानिकारक शक्ति कई गुना बढ़ा देती है। जब किसान कीटनाशक दवाइयां फसलों के ऊपर छिड़कता है तो पौधे के प्रत्येक उत्तक में प्रवेश कर उन्हें जहरीला बना देता है जिससे तुरन्त तितली, कीड़े मकोड़े आदि नष्ट होते हैं और शेष कुछ बच जाते हैं। फसल पर छिड़काव से तरकारी, फल व तेल वाले बीजों में धोने और पकाने से भी कीटनाशक दवाई का प्रभाव नहीं जाता है। दूध और मक्खन आदि में यह जहर काफी मात्रा में पाया जाने लगा है। इसके अतिरिक्त जो कीड़े मकोड़े फसल के परागण में मदद करते हैं एवम् उन पर आक्रान्ती करने वाले कीडे, मकोड़े, पक्षी भी नष्ट हो जाते हैं। कीटनाशक दवाई मे प्रभावित सूखी पत्तियां गिर कर मिट्टी में मिल जाती हैं जिन्हें खाकर केंचुये मर जाते हैं। केंचुओं कीड़ो को खाने से सेविन चिड़ियां मर जाती हैं। चिड़ियों को खाने से मनुष्य व अन्य जीव प्राणी को घातक सिद्ध होती हैं। यहाँ तक पक्षियों के अण्डों में भी डी० डी० टी० पायी गई है। जिन गायों ने प्रभावित घास खायी है उनके दूध में डी० डी० टी० पायी गई। तथा जिन बच्चों या व्यस्कों ने उस दूध को पिया तो उनके दूध में डी० डी० टी० मिली हे। इससे आप पता लगा सकते हैं कि जब मनुष्य प्रकृति संतुलन के नियम को तोड़ने की कोशिश करता है तो उसके खुराक की श्रृंखला में गड़बड़ी हो जाने से विनाश के परिणाम असोमित होते हैं।

जन स्वास्थ्य की दृष्टि से वन्य प्राणियों का बड़ा महत्व है बहुत से जीव जन्तु सफाई करने में मनुष्य का साथ देते हैं जैसे गिद्ध, चील, गीदड़ आदि का समूह जो मृत जीवों को थोड़े समय में ही साफ कर देते हैं और वातावरण को दूषित होने से बचाते हैं। इसी प्रकार मच्छली मेंढक आदि कितने ही कीड़ों को खाकर पानी को साफ रखते हैं।

इसलिये नैतिक, सामाजिक, सांस्कृतिक, आर्थिक, कलात्मक, वैज्ञानिक तथा जन स्वास्थ्य के दृष्टिकोण से वन्य प्राणियों की सुरक्षा हमारे लिये अति आवश्यक है। इस बहुमूल्य सम्पत्ति के संरक्षण व बढ़ाने के लिए अधिक से अधिक राष्ट्रीय पार्क, पशु विहार, बायोस्फीयर रिजर्व आदि कई परियोजनायें चलाई जानी चाहियें यह तभी सम्भव होगा जब प्रत्येक नागरिक यह संकल्प करे कि वन तथा वनों में रहने वाले जीव जन्तुओं की रक्षा के लिये वह भरसक प्रयत्न करेगा जो कि हमारी भावी पीढ़ियों के धरोहर के रूप में है। मनुष्य का अस्तित्व कायम रखने के लिये इस संकल्प का दृढ़ता से पालन करना ही अब एक मात्र उपाय रह गया है।

—:o:—

Antlers of a Castrated Chital Stag (*Axis Axis*)

By

L.N. Acharjyo

Nandankanan Biological Park, P.O. Barang, Dist. Cuttack, Orissa–754 005

One full grown pet adult chital stag (*Axis axis*) was received at the Nandan Kanan Biological Park, Orissa on 6th February, 1975. It was having antlers with many irregularly projecting branches of different sizes covered with velvet (Fig.). It was impossible to distinguish the main beam from the bez and trez tines of the antlers. The stag was very docile and showed no interest towards a chital doe living with him.

The stag died on 30th May 1976, after remaining one year, three months and 25 days in the park. Throughout this period this stag has neither rubbed off the velvet nor cast his antlers though this species has annual antler cycle. The antlers were not hardened, covered with velvet and was fragile. On post-mortem examination the testicles were absent as castrated before his arrival in the park. This peculiar formation of antlers in the stag can be attributed to castration.

The antlers of a chital stag castrated at the age of 8 years grew in irregular and they remained in velvet (Asdell, 1964).

Reference

Asdell, S.A. (1964) : Patterns of Mammalian Reproduction, Second Edition, Cornell University Press, Ithaca, New York—pp. 560-61.

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A forest is known by the animals it rears.

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Edited by Dr. R.N. Misra, Dr. S.K. Sangal, N.K. Jain and Published by Dr. R.N. Misra, Hony. Secretary for the Wildlife Preservation Society of India (Phone: 25392), 7, Astley Hall, Dehra Dun and Printed by T.C. Sharma at Dun Printing House, Rajpur Road, Dehra Dun.

Published on 13/4/83

Siberian Cranes at Keoladeo, Ghana. —*Photo by George Archibald*

Black-necked Cranes at the Beijing Zoo. None exist in captivity outside of China. —***Photo by George Archibald.***

Antlers of a castrated chital stag (*Axis Axis*) at Nandankanan Biological Park, Orissa.

(See article on Page 74)

The Wildlife Preservation Society of India

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   (b) To co-operate with the Govts. of India and States and with other Societies and Institutions having similar aims and objects in working for the interests of wildlife.

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